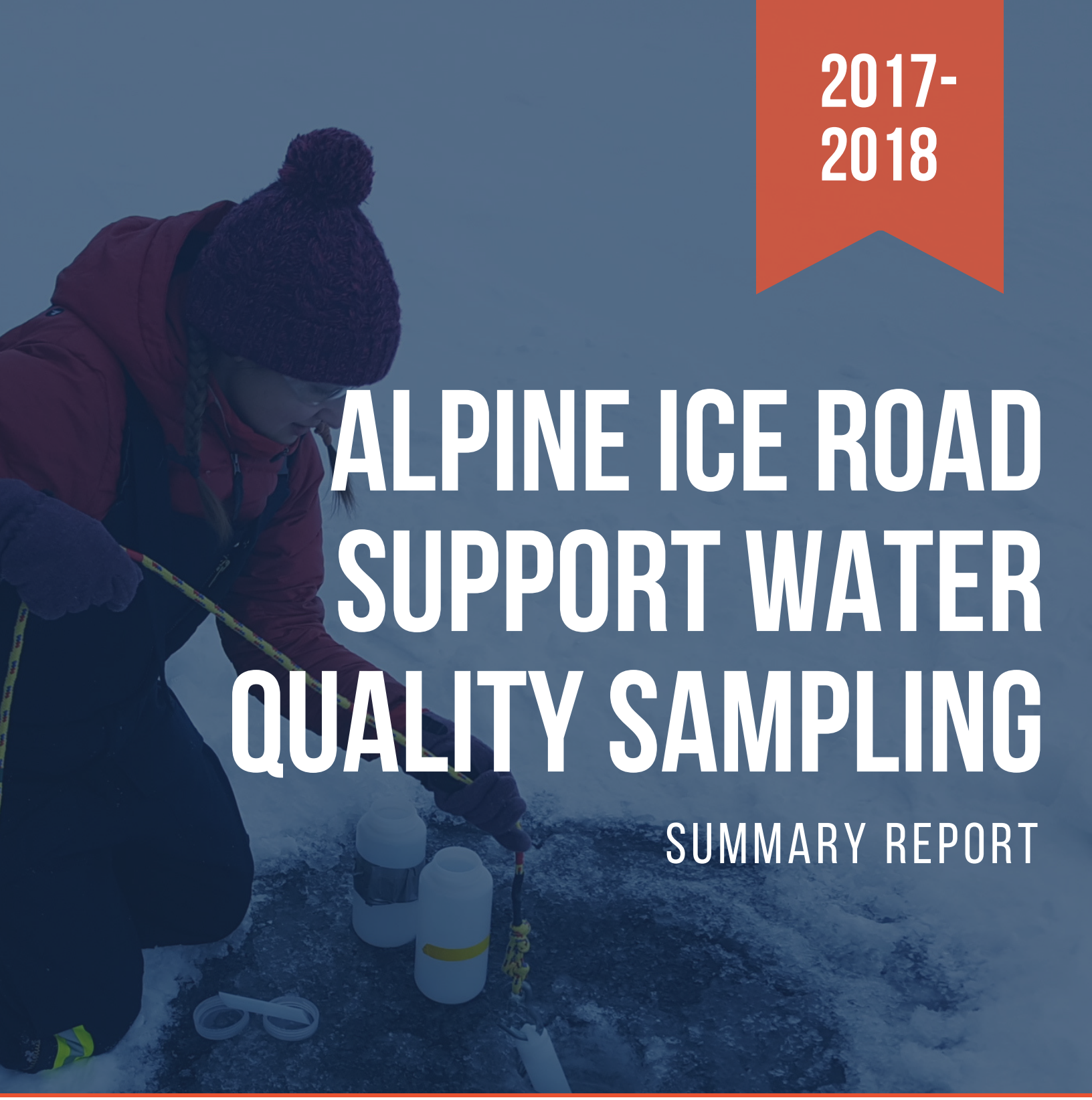

2017-2018

ALPINE ICE ROAD SUPPORT WATER QUALITY SAMPLING

SUMMARY REPORT

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ACRONYMS & ABBREVIATIONS

%	percent
°C	degrees Celsius
C	conductivity
CPAI	ConocoPhillips Alaska, Inc.
DO	dissolved oxygen
ft	feet
ft/s	feet per second
µS/cm	microSiemens per centimeter
mS/cm	milliSiemens per centimeter
mg/L	milligrams per liter
ml/L	milliliters per liter
Michael Baker	Michael Baker International
NAD83	North American Datum of 1983
NE	northeast
NW	northwest
ppt	parts per thousand
S	salinity
SC	specific conductance
SU	standard units
t	temperature, in degrees Celsius
T	temperature, in degrees Kelvin
TDS	total dissolved solids
UMIAQ	UMIAQ, LLC

1.0 INTRODUCTION

The 2017/2018 Alpine Ice Road Support Water Quality Sampling Summary Report presents the results of 25 weekly water quality sampling events conducted by Michael Baker International (Michael Baker) during the 2017/2018 ice road construction season for ConocoPhillips Alaska, Inc (CPAI). Water quality sampling requirements are set by Alaska Department of Fish and Game Fish Habitat Permits and Alaska Department of Natural Resources Temporary Water Use Authorizations.

The 2017/2018 Alpine ice road support water quality sampling locations included six locations upstream and downstream from the centerline of the Colville River ice bridge, two locations near the north side of the ASRC Minesite 2005 Cell, two locations near the center of the ASRC Minesite 2017 Cell, one location near the center of Lake M0675, and two locations near the Northwest (NW) and Northeast (NE) corners of Nanuq Lake (referred to as Relic Site NW and Relic Site NE). Figure 1 provides a map of the sampling locations. Attachment A contains the geographic coordinates of the sampling locations, referenced to the North American [horizontal] Datum of 1983 (NAD83).

Table 1 lists the sampling event dates at each sampling location. Data gathered during sampling events at the Colville River ice bridge was used to 1) determine if water withdrawn from the Colville River could be used for Colville River ice bridge construction and 2) evaluate whether the freeboard beneath the Colville River ice bridge was sufficient to allow for the maintenance of fish habitat throughout the season. Data gathered during sampling events at ASRC Minesite 2005 Cell, ASRC Minesite 2017 Cell, Lake M0675, and Nanuq Lake Relic Site NW and Relic Site NE was used to evaluate if water and/or water equivalent of ice aggregate withdrawn could be used for ice road construction.

Table 1: Sampling Event Dates

Sampling Location	Nov 2017					Dec 2017				Jan 2018					Feb 2018				Mar 2018				Apr 2018		
	1-Nov	8-Nov	15-Nov	21-Nov	29-Nov	6-Dec	13-Dec	20-Dec	27-Dec	3-Jan	10-Jan	17-Jan	24-Jan	31-Jan	7-Feb	14-Feb	21-Feb	28-Feb	7-Mar	14-Mar	21-Mar	28-Mar	4-Apr	11-Apr	18-Apr
Colville River Ice Bridge	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ASRC Minesite 2005 Cell												✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ASRC Minesite 2017 Cell															✓	✓	✓	✓							
Lake M0675				✓																					
Nanuq Lake				✓																					

UMIAQ, LLC (UMIAQ) and CPAI Alpine Field Environmental Coordinators provided support during the field program and contributed to a safe and productive field season.

Harrison Bay

N
W
E
S

CD 3

Lake M0675

Ulamnigiaq Channel

Tamayayak Channel

Sakoonang Channel

Alpine CD 1

CD 2

Nanuq Lake

Tamayayak

CD 5

Sakoonang Channel

Nigliagvik Channel

CD 4

Nigliq Channel

Colville River East Channel

Colville 1200D

Colville 800D

Colville 400D

Colville 400U

Colville 800U

Colville 1200U

Feet
0 300 600

ASRC Minesite 2005 Cell

ASRC Minesite 2017 Cell

Putu Channel

Nuiqsut

Legend

- Sampling Location
- Ice Road
- Gravel Road
- Existing Facility

Miles
0 1 2

ConocoPhillips Alaska

Date:	4/13/2018	Project:	162998
Drawn:	JGM	File:	Figure 1
Checked:	SME	Scale:	1 in = 1.25 miles

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2017/2018 Alpine Ice Road Support
Water Quality Sampling Locations

FIGURE 1

(SHEET 1 of 1)

2.0 METHODS

A two-person Michael Baker field crew conducted the first Colville River ice bridge sampling event, prior to ice road construction. For each subsequent sampling event, except for one event in December, a one-person Michael Baker field crew completed the sampling. UMIAQ provided transportation to the sampling locations and general field support. Snow machine travel was required for the first nine sampling events because tundra travel by Hägglunds was not authorized. Hägglunds were used for transportation during the remainder of the season.

All six Colville River ice bridge sampling locations were marked with snow poles during the first sampling event. These locations are in the approximate thalweg of the Colville River where maximum depth has historically been observed. The snow poles were removed at the end of the season. All other sampling locations were established during previous ice road construction seasons and located via NAD83 coordinates provided by CPAI as sampling was required. No markers were installed at any locations other than upstream and downstream from the centerline of the Colville River ice bridge.

Field sampling methods were based on United States Geological Survey (USGS 2006) and Ward and Harr (Ward and Harr 1990) methods. Safety precautions were followed using the North Slope Water Resources 2017 Health, Safety, and Environment Plan (Michael Baker 2017a) and the 2017-2018 Winter Hydrology Programs – Job Safety Analysis (Michael Baker 2017b).

2.1 SAMPLING PARAMETERS

Table 2 lists the sampling parameters evaluated at each sampling location.

Table 2: Sampling Parameters

Sampling Location	In-Situ Measurements				In-Situ Recordings					Ex-Situ Recordings						Calculations		
	Water Depth	Ice Thickness	Snow Depth	Freeboard	Temperature	Conductivity	Dissolved Oxygen	Salinity	Velocity	Temperature	Conductivity	Salinity	pH	Settleable Solids	Turbidity	Specific Conductance	Dissolved Oxygen	Total Dissolved
	ft	ft	ft	ft	°C	µS/cm	% saturation	ppt	ft/s	°C	µS/cm	ppt	SU	ml/L	NTU	µS/cm	mg/L	mg/L
Colville River Ice Bridge	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓	✓	
ASRC Minesite 2005 Cell										✓			✓	✓				
ASRC Minesite 2017 Cell										✓			✓	✓	✓			
Lake M0675	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓				✓	✓	✓
Nanuq Lake										✓	✓	✓				✓		✓

Water quality was sampled by drilling sample holes through the ice using either a 2-inch or 6-inch diameter auger attached to a 36-volt battery operated drill. In-situ measurements were evaluated from the drilled sample hole and immediate surrounding area. In-situ recordings, ex-situ recordings, and calculations based on recordings were evaluated from the drilled sample hole.

In-Situ Measurements

Snow depth and freeboard were measured with a survey pocket rod, ice thickness was measured with an ice pole marked in half-foot intervals, and water depth was measured using the YSI ProPlus meter data cables marked in one-foot intervals. Freeboard was measured from the top of ice to the water surface and water depth was measured from the water surface to the bottom of the river or lake.

In-Situ Recordings

Temperature, conductivity (C), and salinity were recorded using the YSI ProPlus meter, dissolved oxygen (DO) was measured using the YSI ProODO meter (Photo 1), and velocity was measured using the HACH

FH950 meter (Photo 2). Temperature, salinity, conductivity, DO, and velocity were recorded from the river or lake bottom to below the ice at a maximum of two-foot intervals. The YSI ProPlus and YSI ProODO meter data cables were taped together to ensure measurements were recorded simultaneously and at the same water depth.

Velocities were recorded 1,200 feet (ft) downstream from the centerline of the Colville River ice bridge at the same water depths where water quality parameters were recorded.

Photo 1: YSI ProPlus and YSI ProODO meters

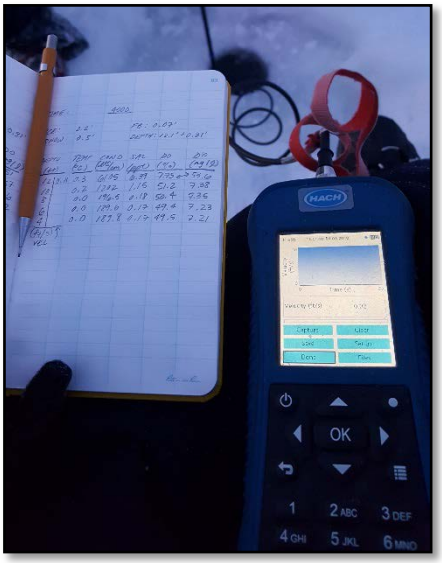

Photo 2: In-situ velocity recordings using a HACH FH950 meter

Ex-Situ Recordings

During the first four sampling events at the ASRC Minesite 2005 Cell and the first two sampling events at the ASRC Minesite 2017 Cell, two one-liter bottles of water samples were collected from holes drilled in the ice (Photo 3). Once the pump house was installed and operating, water samples were collected from the return hose, truck fill hose, or by-pass hose. At the time of sample collection, any visual observation of oily sheen was documented. Temperature and pH were recorded within 15 minutes of sample collection and the average value of each recording was reported. Upon returning to CD1, a volumetric test for settleable solids, following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540 F: Settleable Solids* (Rice, Baird, Eaton, & Clesceri 2012), and a turbidity test, in compliance with EPA method 180.1 and ISO 7027 (EPA 1993), were performed on both water samples.

Photo 3: Ex-situ water quality sampling

During the sampling events at Lake M0675 and at Nanuq Lake Relic Site NW and Relic Site NE, two one-liter bottles of ice aggregate were collected from ice auger cuttings obtained from the top two feet of ice and transported back to CD1. Once thawed, temperature, conductivity, and salinity were recorded using the YSI ProPlus meter.

Calculations

Specific conductance (SC) was calculated using recorded water temperature and conductivity using the following equation (specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data):

$$SC = \frac{C}{(1 + (0.0196 * (t - 25)))}$$

Where,

SC = specific conductance in µS/cm, referenced to 25°C
C = conductivity in µS/cm
t = temperature in °C

Dissolved oxygen was calculated using recorded percent (%) saturated dissolved oxygen, temperature, and salinity using the following equation (Benson & Krause 1984):

$$DO_{mg/L} = \frac{DO_{\%\ saturation}}{100} * e^{-139.34411 + \frac{1.575701 * 10^5}{T} - \frac{6.642308 * 10^7}{T^2} + \frac{1.243800 * 10^{10}}{T^3} - \frac{8.621949 * 10^{11}}{T^4}} * e^{-S * \left(0.017674 - \frac{10.754}{T} + \frac{2140.7}{T^2}\right)}$$

Where,

$DO_{mg/L}$ = dissolved oxygen in milligrams per liter (mg/L)
$DO_{\%saturation}$ = dissolved oxygen in % saturation
T = temperature in Kelvins ($t_{°C}$ + 273.15)
S = salinity in ppt

Total dissolved solids (TDS) were calculated using calculated specific conductance using the following equation (Rice, Baird, Eaton, & Clesceri 2012):

$$TDS = SC * 0.65$$

Where,

TDS = total dissolved solids in mg/L
SC = specific conductance in µS/cm, referenced to 25°C

2.2 INSTRUMENT CALIBRATION

The morning of each sampling event, the YSI ProPlus meters were calibrated using 1,413 microsiemens per centimeter (µS/cm) conductivity standard, the Hanna pH meters were two-point calibrated using pH 4.01 and pH 7.00 buffer solution, the YSI ProODO meters were calibrated by entering the current barometric pressure and verified by testing bottled water, and the HACH 2100P turbidity meter or HF Scientific Micro TPW turbidity meter were validated using turbidity standards. Approximately every four weeks, the YSI ProPlus and YSI ProODO water quality meters were calibrated by TTT Environmental Instruments and Supplies according to manufacturer specifications.

2.3 INSTRUMENT ACCURACY

Table 3 lists the accuracy of each instrument.

Table 3: Instrument Accuracy

Instrument	Parameter	Accuracy
YSI ProPlus	Temperature	+/- 0.2°C
	Conductivity	+/- 0.1% of reading or 0.001 milliSiemens per centimeter (mS/cm), whichever is greater
	Salinity	+/- 1.0% of reading or +/- 0.1 parts per thousand (ppt), whichever is greater
YSI ProODO	Temperature	+/- 0.2°C
	Dissolved Oxygen (% saturation)	0-200%, +/- 1% reading or +/- 1%, whichever is greater
HACH FH950	Velocity	Zero stability of +/- 0.05 feet per second (ft/s) and an accuracy of +/- 2.0% of the reading plus the meter's zero stability
Hanna HI98128	Temperature	+/- 0.5°C
	pH	+/- 0.05
HACH 2100P	Turbidity	+/- 2% of reading plus stray light from 0-1000 Nephelometric Turbidity Units (NTU); stray light is < 0.02 NTU
HF Scientific Micro TPW		+/- 2% of reading or +/- 0.01 NTU (0-500 NTU); 3% of reading (500-1,100 NTU)

3.0 RESULTS

Each sampling event was summarized in a Project Trip Report transmitted electronically to CPAI within 24 hours of data collection and are included in Attachment B.

3.1 COLVILLE RIVER ICE BRIDGE

Colville River ice bridge crossing profiles, provided by ICE Design and Consult, are included in Attachment C.

In-Situ Measurements

Ice thickness generally increased over time, ranging from an average of 0.9 ft on November 1, 2017 to an average of 4.5 ft on April 18, 2018. Minimum ice thickness was 0.7 ft on November 1, 2017 at 800 ft downstream, maximum ice thickness was 5.0 ft on April 11, 2018 at 400 ft upstream. Chart 1 presents the maximum, minimum, and average ice thickness results at all locations and depths during the ice bridge sampling season.

Snow depth generally increased over time, ranging from an average of 0.0 ft on November 1, 2017 to an average of 0.5 ft on April 18, 2018. Minimum snow depth was 0.0 ft on November 1, 2017 at all locations except 1,200 ft downstream where it was 0.1 ft, maximum snow depth was 0.8 ft on April 18 at 800 ft upstream. Chart 2 presents the maximum, minimum, and average snow depth results at all locations during the ice bridge sampling season.

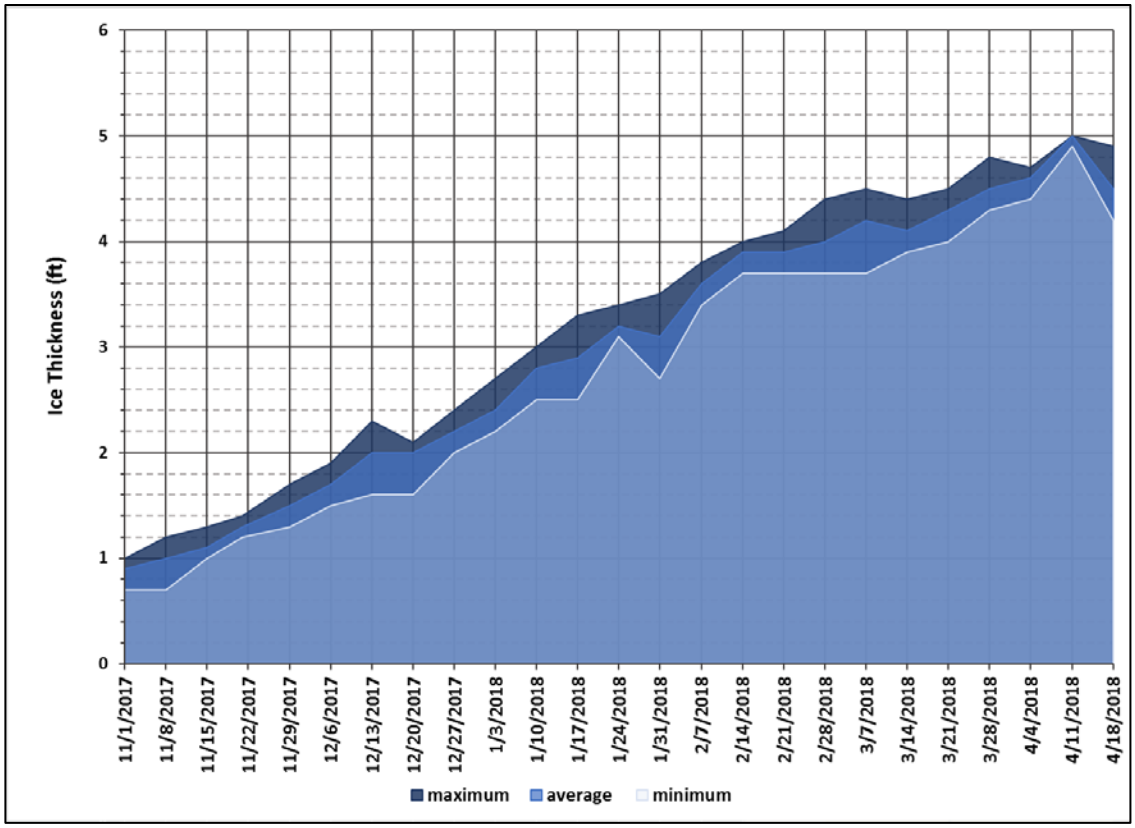

Chart 1: Weekly Ice Thickness Sample Results

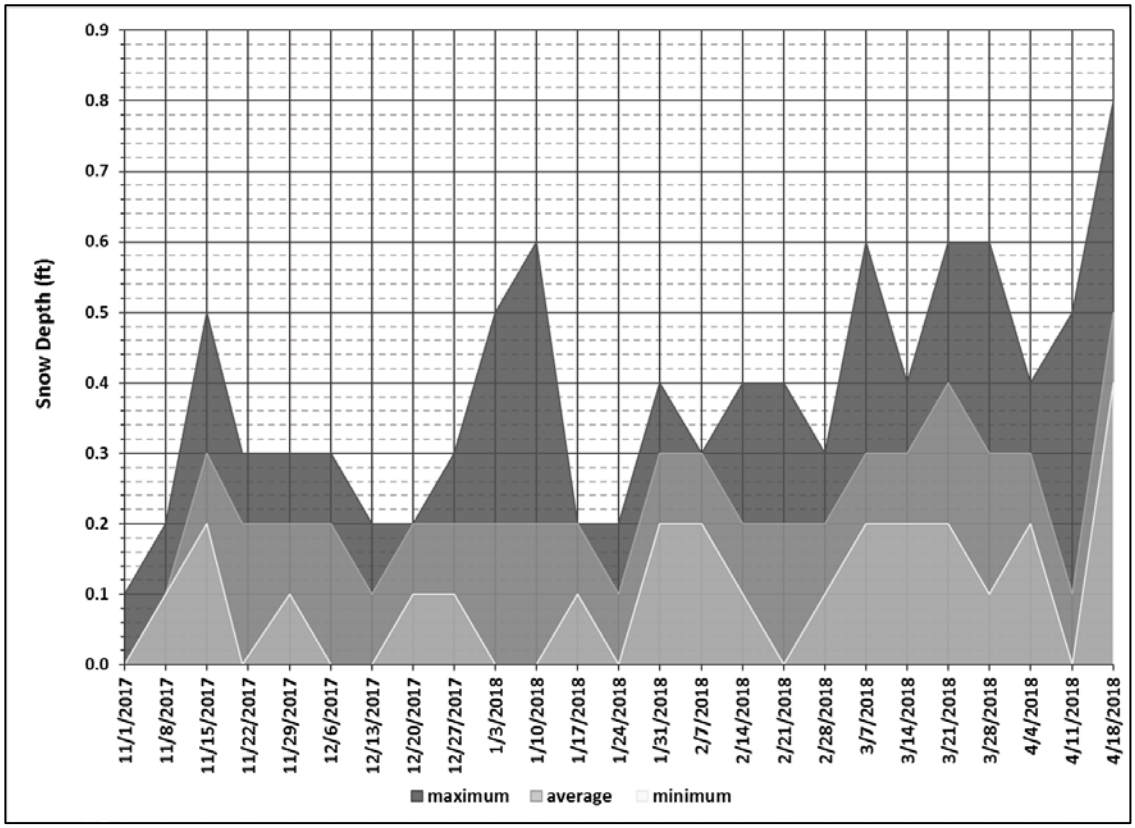

Chart 2: Weekly Snow Depth Sample Results

In-Situ Recordings and Calculations

DO saturation generally decreased over time between November 1, 2017 and March 7, 2018, ranging from an average of 95.1% on November 1, 2017 to an average of 44.7% on March 7, 2018. DO saturation generally increased over time between March 14, 2018 and April 18, 2018, ranging from an average of 46.2% on March 14, 2018 to an average of 67.0% on April 18, 2018. Maximum DO saturation was 119.2% on April 18, 2018 at 1,200 feet ft upstream near the bottom of the water column. Minimum DO saturation was 36.0% on March 28, 2018 at 1,200 ft upstream near the bottom of the water column. Chart 3 presents the maximum, minimum, and average DO sample results at all locations and depths during the ice bridge sampling season.

Salinity generally increased over time, ranging from an average of 0.1 ppt on November 1, 2017 to an average of 5.4 ppt on April 18, 2018. Minimum salinity was 0.1 ppt on November 1, 2017 at 1,200 ft upstream near the bottom of the water column. Maximum salinity was 17.3 ppt on February 28, 2018 at 800 ft downstream near the bottom of the water column. Chart 4 presents the maximum, minimum, and average salinity sample results at all locations and depths during the ice bridge sampling season.

SC generally increased over time, ranging from an average of 326 µS/cm on November 1, 2017 to an average of 9,703 µS/cm on April 18, 2018. Maximum SC was 29,586 µS/cm on February 28, 2018 at 800 ft downstream near the bottom of the water column. Minimum SC was 221 µS/cm on December 17, 2017 at 800 ft upstream in the middle of the water column. Chart 5 presents the maximum, minimum, and average SC sample results at all locations and depths during the ice bridge sampling season. Saltwater intrusion from Harrison Bay, evidenced by higher levels of measured salinity and conductivity, was first detected at the ice bridge on December 27, 2017.

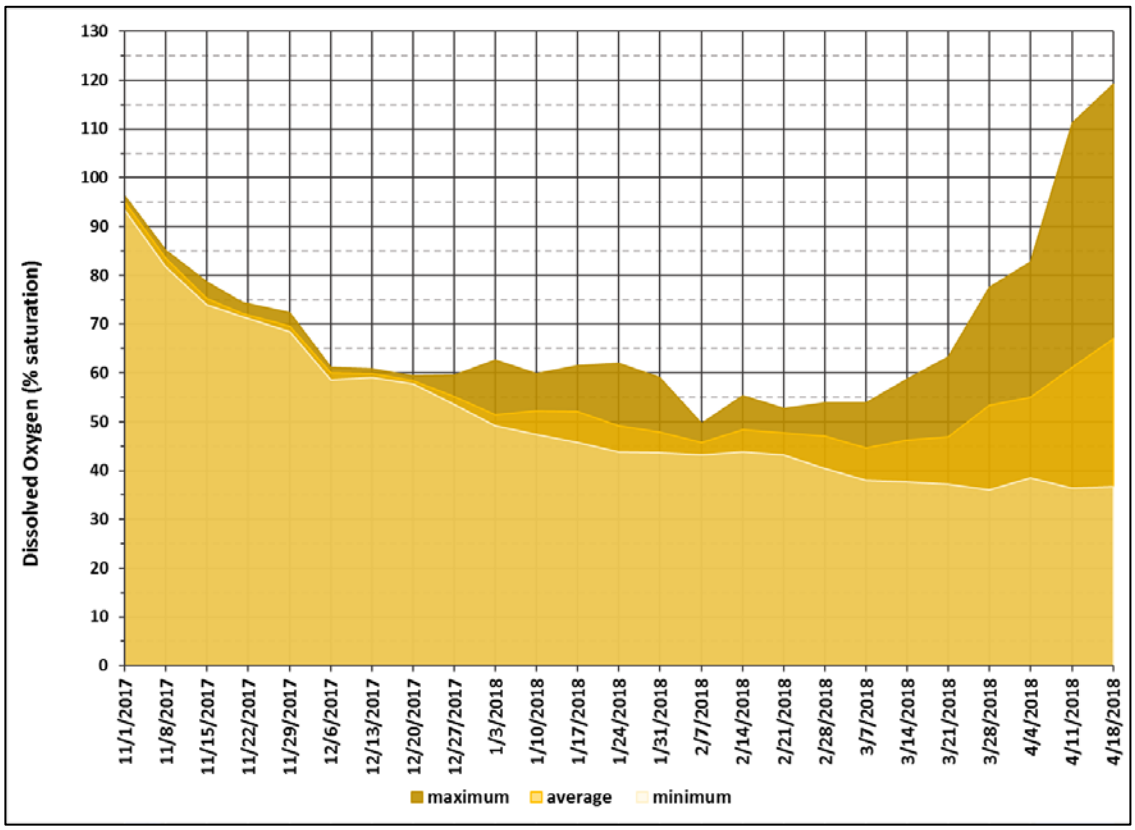

Chart 3: Weekly DO Sample Results

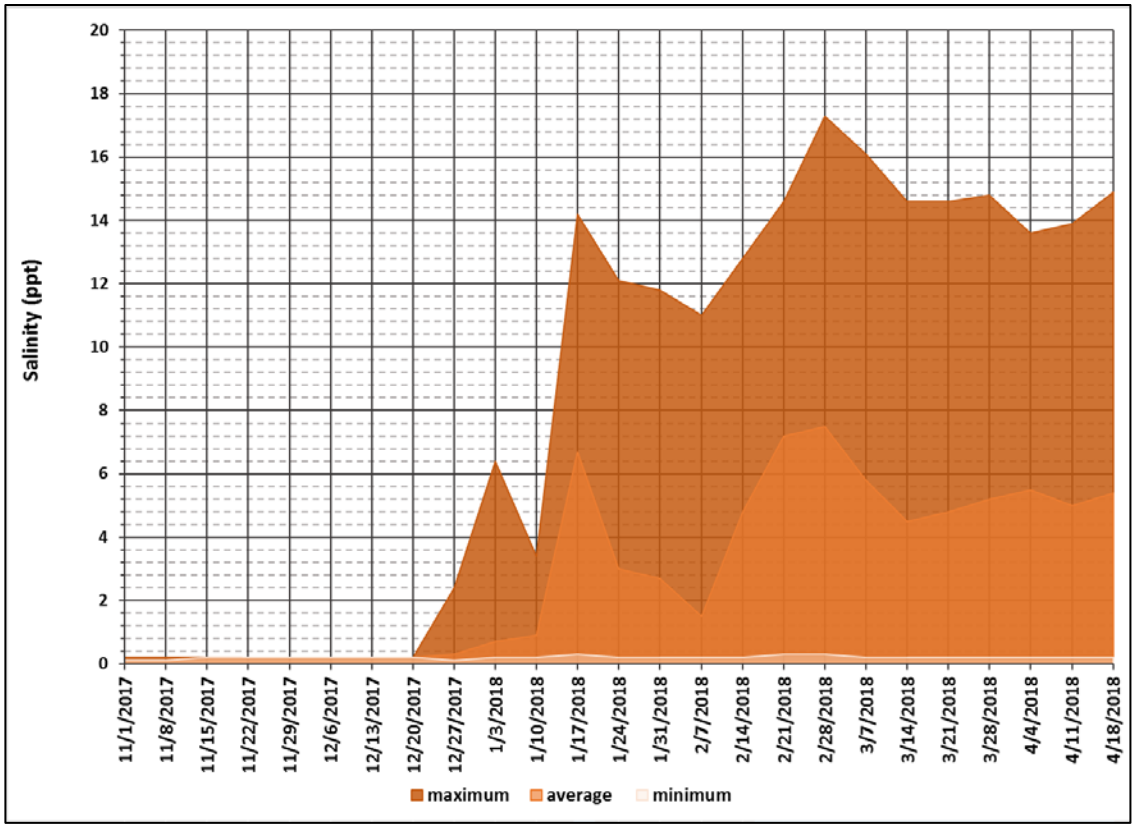

Chart 4: Weekly Salinity Sample Results

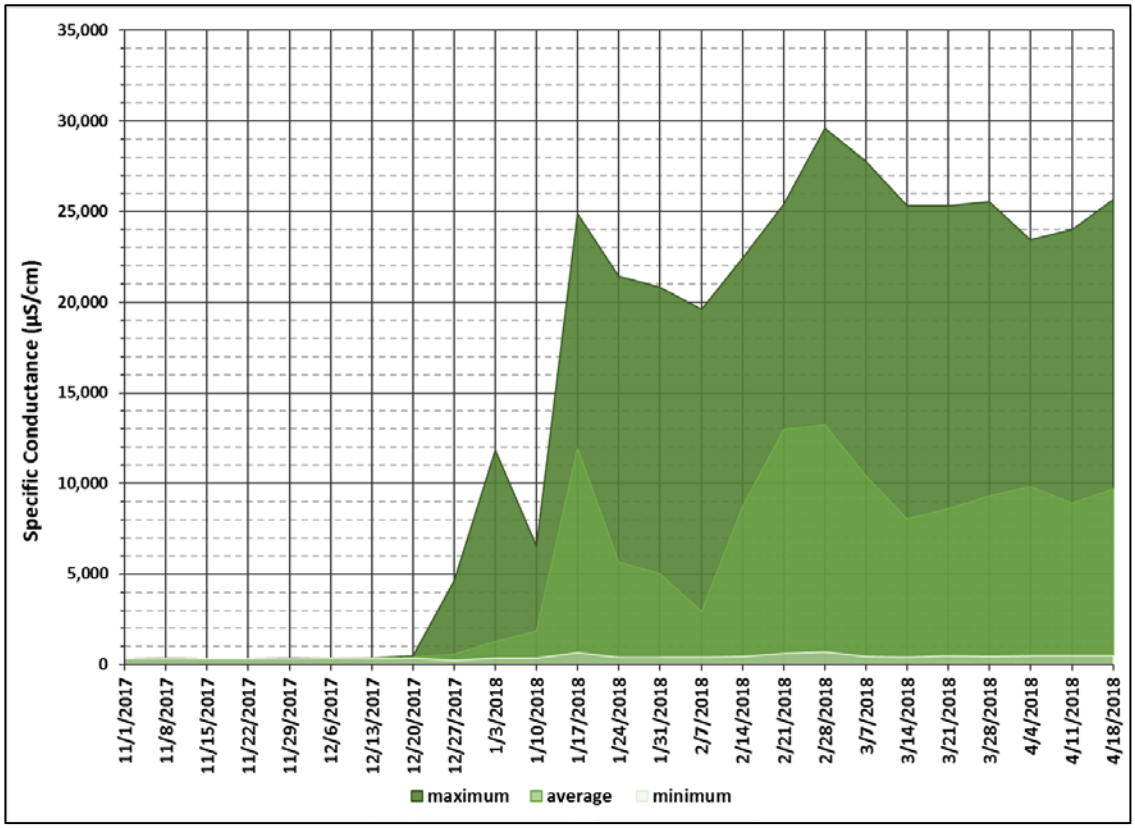

Chart 5: Weekly SC Sample Results

Velocities recorded at 1,200 feet downstream from the centerline of the Colville River ice bridge were generally low, ranging from an average of 0.6 ft/s on November 1, 2017 to an average of 0.4 ft/s in the downstream direction on April 18, 2018. Flow direction often alternated throughout the water column between upstream and downstream. Measured velocity was sometimes less than the accuracy of the meter, indicating little to no flow was present. This occurred most consistently throughout the second half of the season.

Table 4 presents the weekly maximum, minimum, and average velocity results at all depths during the ice bridge sampling season.

Table 4: Weekly Velocity Sample Results

Sample Date	Maximum Velocity		Average Velocity		Minimum Velocity	
	Velocity[1] (ft/s)	Flow Direction[2] (DS/US)	Velocity (ft/s)	Flow Direction (DS/US)	Velocity (ft/s)	Flow Direction (DS/US)
11/1/2017	0.09	US	0.06	DS	0.03*	US
11/8/2017	0.40	DS	0.22	DS	0.10	US
11/15/2017	0.18	DS	0.13	DS	0.08	DS
11/21/2017	NOT RECORDED					
11/29/2017	0.00*	N/A	0.00*	N/A	0.00*	N/A
12/6/2017	0.25	DS	0.18	DS	0.11	DS
12/13/2017	0.17	DS	0.08	DS	0.05*	DS
12/20/2017	0.17	US	0.10	US	0.05*	US
12/27/2017	0.14	DS	0.09	DS	0.00*	N/A
1/3/2018	0.11	DS	0.02*	US	0.02*	DS
1/10/2018	0.14	DS	0.07	DS	0.03*	DS
1/17/2018	0.12	DS	0.02*	DS	0.01*	US
1/24/2018	0.16	DS	0.04*	DS	0.01*	US
1/31/2018	0.04*	DS	0.01*	DS	0.01*	DS
2/7/2018	0.01*	DS	0.01*	DS	0.00*	N/A
2/14/2018	0.25	DS	0.06	DS	0.01*	DS
2/21/2018	0.89	DS	0.34	DS	0.00*	N/A
2/28/2018	0.38	DS	0.07	DS	0.01*	DS/US
3/7/2018	0.13	DS	0.05*	DS	0.00*	N/A
3/14/2018	0.06	DS	0.02*	DS	0.01*	US
3/21/2018	0.01*	DS	0.00*	N/A	0.00*	N/A
3/28/2018	0.06	DS	0.02*	DS	0.00*	N/A
4/4/2018	0.03	DS	0.01	DS	0.00*	N/A
4/11/2018	0.01	US	0.00*	N/A	0.00*	N/A
4/18/2018	0.08	DS	0.04	DS	0.02	DS

Notes:
1. Velocities marked with an asterisk "*" indicate the measurement was less than or equal to the accuracy of the velocity meter
2. DS = downstream, US = upstream

3.2 ASRC MINESITE 2005 CELL

Ex-situ pH ranged between 6.7 and 7.6 throughout the sampling season. No oily sheen was observed and no settleable solids were measured during any of the sampling events.

3.3 ASRC MINESITE 2017 CELL

Ex-situ pH ranged between 6.8 and 7.6 throughout the sampling season. No oily sheen was observed and no settleable solids were measured during any of the sampling events.

Ex-situ turbidity ranged from a minimum of 1.25 NTU on February 21, 2018 to a maximum of 24.64 NTU on February 28, 2018. The Minesite was undergoing dewatering during the sampling events.

3.4 LAKE M0675

In-Situ Recordings & Calculations

DO saturation ranged from a minimum of 81.0% to a maximum of 83.0%; average DO saturation was 82.1%.

SC ranged from a minimum of 18,571 µS/cm to a maximum of 26,726 µS/cm; average SC was 23,776 µS/cm.

TDS ranged from a minimum of 12,071 mg/L to a maximum of 17,372 mg/L; average TDS was 15,455 mg/L.

Ex-Situ Recordings & Calculations

Thawed ice aggregate SC ranged from a minimum of 1,162 µS/cm to a maximum of 1,177 µS/cm; average SC was 1,170 µS/cm.

Thawed ice aggregate TDS ranged from a minimum of 756 mg/L to a maximum of 765 mg/L; average TDS was 760 mg/L.

3.5 NANUQ LAKE

Ex-Situ Calculations – Relic Site NW

Thawed ice aggregate ex-situ SC ranged from a minimum of 33.0 µS/cm to a maximum of 40.0 µS/cm; average SC was 36.5 µS/cm.

Thawed ice aggregate ex-situ TDS ranged from a minimum of 21.4 mg/L to a maximum of 26.0 mg/L; average TDS was 23.7 mg/L.

Ex-Situ Calculations – Relic Site NE

Thawed ice aggregate ex-situ SC ranged from a minimum of 5.6 µS/cm to a maximum of 10.2 µS/cm; average SC was 7.9 µS/cm.

Thawed ice aggregate ex-situ TDS ranged from a minimum of 3.7 mg/L to a maximum of 6.7 mg/L; average TDS was 5.2 mg/L.

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Attachment A Sampling Location Coordinates

Sampling Location	Latitude	Longitude
Colville 1200U	N70.2350	W150.8341
Colville 800U	N70.2361	W150.8352
Colville 400U	N70.2371	W150.8361
Colville 400D	N70.2392	W150.8381
Colville 800D	N70.2402	W150.8391
Colville 1200D	N70.2413	W150.8401
ASRC Minesite 2005 Cell	N70.2361	W150.8049
ASRC Minesite 2005 Cell Pump House	N70.2363	W150.8058
ASRC Minesite 2017 Cell	N70.2287	W150.7889
ASRC Minesite 2017 Cell Pump House	N70.2286	W150.7857
Lake M0675	N70.4032	W151.0188
Nanuq Lake Relic Site NW	N70.3274	W151.0413
Nanuq Lake Relic Site NE	N70.3267	W151.0118

Attachment B Project Trip Reports

B.1 Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 11/1/2017
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Lance Hathaway	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 15°F, 10 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, October 31 at 1:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on November 1, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 1:50 PM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The YSI ProPlus meter was calibrated for conductivity and the YSI ProODO meter was calibrated for DO by TTT Environmental and checked for accuracy prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 315 microsiemens per centimeter (µS/cm) at 1,200 feet upstream to a maximum of 334 µS/cm at 1,200 feet downstream. SC was not greater than 500 µS/cm at any location.

The DO saturation ranged between 93.4 percent (%) and 96.4%, with an average of 95.1%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.03 feet per second (ft/s) in the upstream direction at a depth of 11 feet to a maximum of 0.09 ft/s in the upstream direction at a depth of 3 feet; average velocity was 0.06 ft/s in the upstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 0.7 feet to 1.0 feet; average ice thickness was 0.9 feet. Snow depth ranged from 0.0 feet to 0.1 feet; average snow depth was 0.0 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, November 8, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

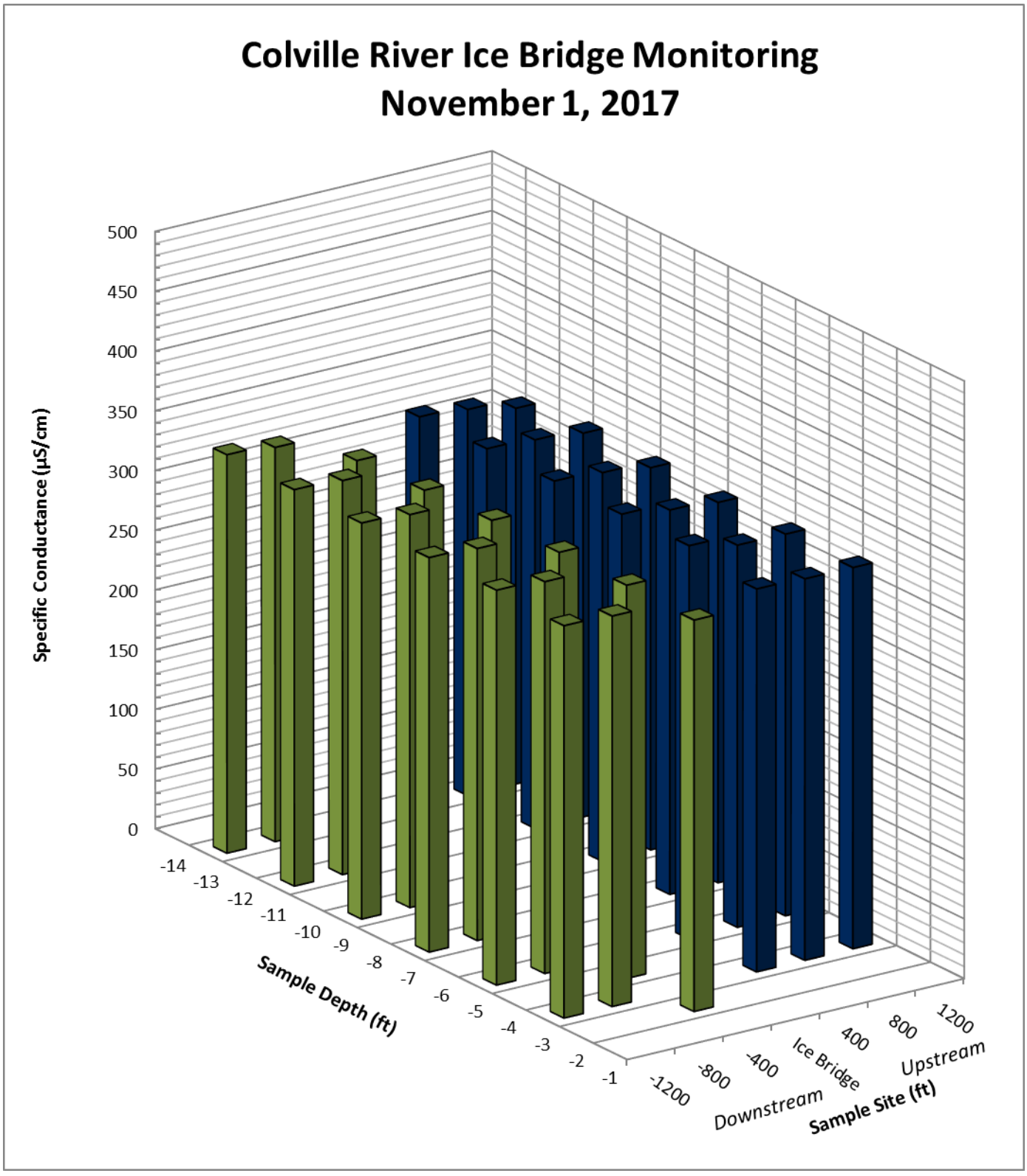
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **2:20 PM**	14.0	0.8	0.0	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	163	320	13.92	95.3	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	168	329	13.92	95.3	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	167	328	13.90	95.2	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	167	328	13.89	95.1	0.2	-
					10	-	-	-	-	-	-	-
					11	0.1	168	328	13.85	95.1	0.2	-
					12	-	-	-	-	-	-	-
					13	0.2	168	327	13.86	95.4	0.2	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **2:06 PM**	14.4	0.9	0.0	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	163	319	13.85	94.8	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	163	320	13.83	94.7	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	165	322	13.76	94.5	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	167	325	13.76	94.5	0.2	-
					10	-	-	-	-	-	-	-
					11	0.2	167	325	13.72	94.5	0.2	-
					12	-	-	-	-	-	-	-
					13	0.5	168	323	13.61	94.5	0.2	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **1:50 PM**	14.6	0.8	0.0	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	163	319	13.85	94.8	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	163	319	13.83	94.7	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	163	318	13.76	94.5	0.2	-
					8	-	-	-	-	-	-	-
					9	0.2	164	320	13.71	94.4	0.2	-
					10	-	-	-	-	-	-	-
					11	0.5	167	321	13.58	94.3	0.2	-
					12	-	-	-	-	-	-	-
					13	1.5	170	315	13.08	93.4	0.1	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **2:40 PM**	13.1	1.0	0.0	0.0	1	-	-	-	-	-	-	-
					2	0.0	167	327	13.95	95.5	0.2	-
					3	-	-	-	-	-	-	-
					4	0.0	168	329	13.95	95.5	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	168	329	13.93	95.4	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	167	328	13.92	95.3	0.2	-
					9	-	-	-	-	-	-	-
					10	0.0	166	326	13.90	95.2	0.2	-
					11	-	-	-	-	-	-	-
					12	0.0	165	323	13.90	95.2	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **2:56 PM**	13.9	0.7	0.0	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	167	327	13.95	95.5	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	167	328	13.95	95.5	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	167	328	13.93	95.4	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	168	329	13.93	95.4	0.2	-
					10	-	-	-	-	-	-	-
					11	0.0	168	330	13.67	93.6	0.2	-
					12	-	-	-	-	-	-	-
					13	0.2	170	330	13.80	95.0	0.2	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **3:30 PM**	14.2	0.9	0.1	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	167	328	14.02	96.0	0.2	-0.09
					4	-	-	-	-	-	-	-
					5	0.0	169	330	14.07	96.3	0.2	-0.08
					6	-	-	-	-	-	-	-
					7	0.1	169	330	14.03	96.3	0.2	-0.05
					8	-	-	-	-	-	-	-
					9	0.1	170	331	14.04	96.4	0.2	-0.04
					10	-	-	-	-	-	-	-
					11	0.1	170	332	14.03	96.3	0.2	-0.03
					12	-	-	-	-	-	-	-
					13	0.2	171	334	14.00	96.4	0.2	-0.06
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 11/8/2017
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** H. Runa
UMIAQ FIELD PERSONNEL: Lance Hathaway	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 20°F, 10 mph S wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, November 7 at 5:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on November 8, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 10:40 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI Pro1030 meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The YSI Professional 1030 meter was calibrated for conductivity and the DO meter was checked for accuracy and calibrated by TTT Environmental prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 318 microsiemens per centimeter (µS/cm) at 1,200 feet upstream to a maximum of 346 µS/cm at 400 feet upstream. SC was not greater than 500 µS/cm at any location.

The DO saturation ranged between 81.7 percent (%) and 85.1%, with an average of 83.6%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.10 feet per second (ft/s) in the upstream direction at a depth of 14 feet to a maximum of 0.40 ft/s in the downstream direction at a depth of 8 feet; average velocity was 0.22 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 0.7 feet to 1.2 feet; average ice thickness was 1.0 feet. Snow depth ranged from 0.1 feet to 0.2 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, November 15, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

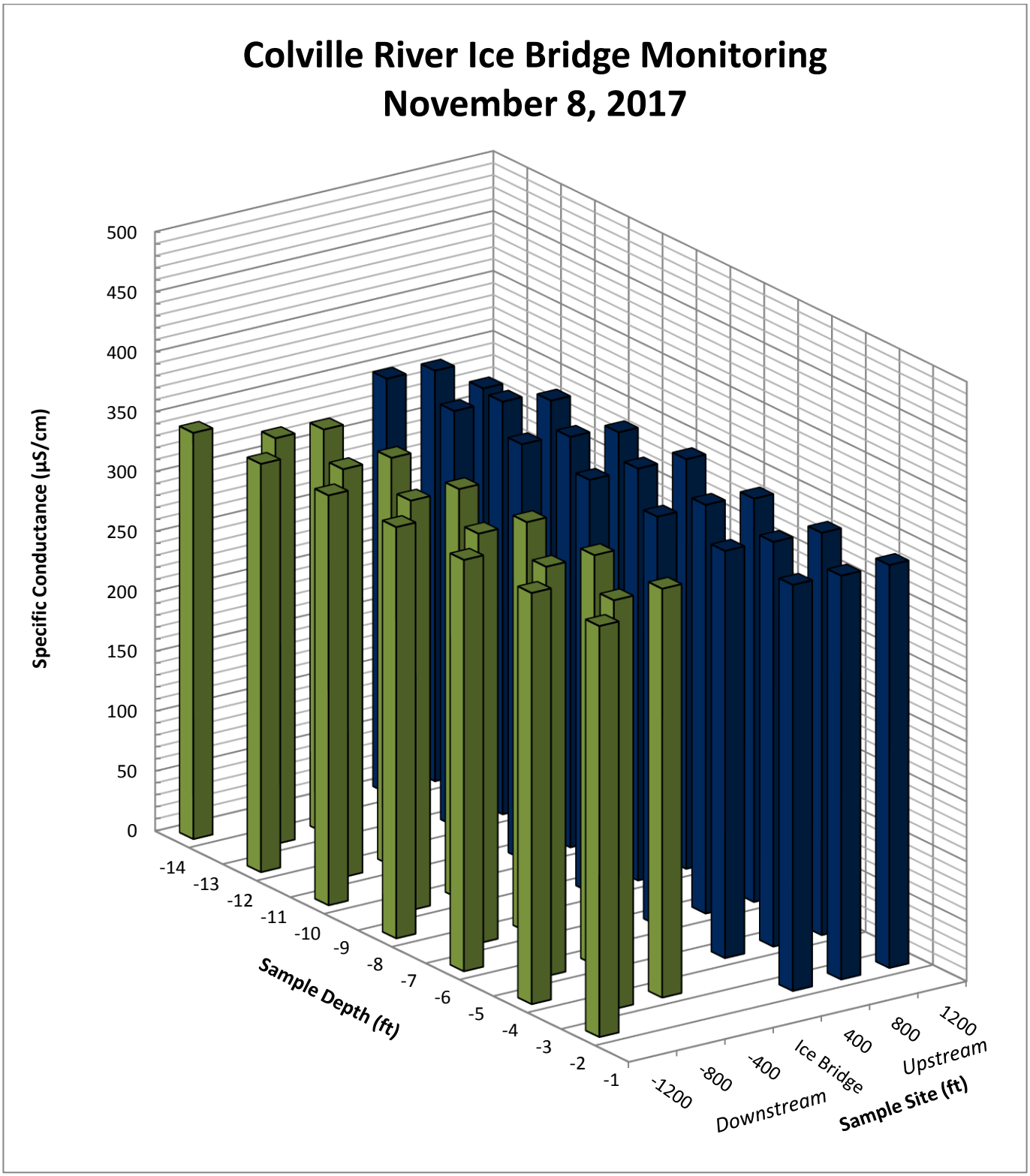
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **11:10 AM**	14.9	1.0	0.1	0.0	1	-	-	-	-	-	-	-
					2	0.0	173	339	12.17	83.3	0.2	-
					3	-	-	-	-	-	-	-
					4	0.0	173	340	12.17	83.3	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	174	341	12.17	83.3	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	175	344	12.17	83.3	0.2	-
					9	-	-	-	-	-	-	-
					10	0.0	176	346	12.17	83.3	0.2	-
					11	-	-	-	-	-	-	-
					12	0.0	177	346	12.18	83.4	0.2	-
					13	-	-	-	-	-	-	-
					14	0.1	177	346	12.15	83.4	0.2	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:53 AM**	15.3	1.2	0.1	0.1	1	-	-	-	-	-	-	-
					2	0.0	172	337	12.18	83.4	0.2	-
					3	-	-	-	-	-	-	-
					4	0.0	172	337	12.18	83.4	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	174	341	12.17	83.3	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	175	344	12.18	83.4	0.2	-
					9	-	-	-	-	-	-	-
					10	0.1	175	342	12.17	83.6	0.2	-
					11	-	-	-	-	-	-	-
					12	0.2	177	344	12.17	83.8	0.2	-
					13	-	-	-	-	-	-	-
					14	0.4	177	343	12.23	84.7	0.2	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **10:40 AM**	15.6	1.1	0.1	0.0	1	-	-	-	-	-	-	-
					2	0.0	171	336	12.14	83.1	0.2	-
					3	-	-	-	-	-	-	-
					4	0.1	172	335	12.10	83.1	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	172	336	12.07	82.9	0.2	-
					7	-	-	-	-	-	-	-
					8	0.2	176	342	12.04	82.9	0.2	-
					9	-	-	-	-	-	-	-
					10	0.4	174	337	11.96	82.8	0.2	-
					11	-	-	-	-	-	-	-
					12	0.9	177	335	11.73	82.4	0.2	-
					13	-	-	-	-	-	-	-
					14	2.4	177	318	11.17	81.7	0.2	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:25 AM**	15.1	0.9	0.1	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	174	341	12.24	83.8	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	174	342	12.24	83.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	174	342	12.24	83.8	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	174	342	12.24	83.8	0.2	-
					10	-	-	-	-	-	-	-
					11	0.1	174	340	12.20	83.8	0.2	-
					12	-	-	-	-	-	-	-
					13	0.4	174	336	12.09	83.7	0.2	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:41 AM**	14.6	0.7	0.2	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	174	341	12.24	83.8	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	174	342	12.24	83.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	174	342	12.24	83.8	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	174	342	12.22	83.7	0.2	-
					10	-	-	-	-	-	-	-
					11	0.1	174	340	12.19	83.7	0.2	-
					12	-	-	-	-	-	-	-
					13	0.2	174	339	12.13	83.5	0.2	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **12:07 PM**	15.5	1.0	0.2	0.0	1	-	-	-	-	-	-	-
					2	0.0	175	343	12.31	84.3	0.2	0.31
					3	-	-	-	-	-	-	-
					4	0.0	175	343	12.31	84.3	0.2	0.35
					5	-	-	-	-	-	-	-
					6	0.0	175	343	12.34	84.5	0.2	0.38
					7	-	-	-	-	-	-	-
					8	0.0	175	343	12.36	84.6	0.2	0.40
					9	-	-	-	-	-	-	-
					10	0.1	175	342	12.34	84.7	0.2	0.38
					11	-	-	-	-	-	-	-
					12	0.2	175	341	12.36	85.1	0.2	-0.18
					13	-	-	-	-	-	-	-
					14	0.4	176	339	12.00	83.1	0.2	-0.10

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 11/15/2017
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** H. Runa
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 10°F, 15 mph E wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, November 14 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on November 15, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 11:35 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The YSI ProPlus meter was calibrated for conductivity and the YSI ProODO meter was calibrated for DO by TTT Environmental and checked for accuracy prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 320 microsiemens per centimeter (µS/cm) at 400 feet upstream to a maximum of 331 µS/cm at 800 feet downstream. SC was not greater than 500 µS/cm at any location.

The DO saturation ranged between 74.0 percent (%) and 78.7%, with an average of 75.3%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.08 feet per second (ft/s) at a depth of 2 feet to a maximum of 0.18 ft/s at a depth of 12 feet; average velocity was 0.13 ft/s. Velocity throughout the water column was in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 1.0 feet to 1.3 feet; average ice thickness was 1.1 feet. Snow depth ranged from 0.2 feet to 0.5 feet; average snow depth was 0.3 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Tuesday, November 21, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

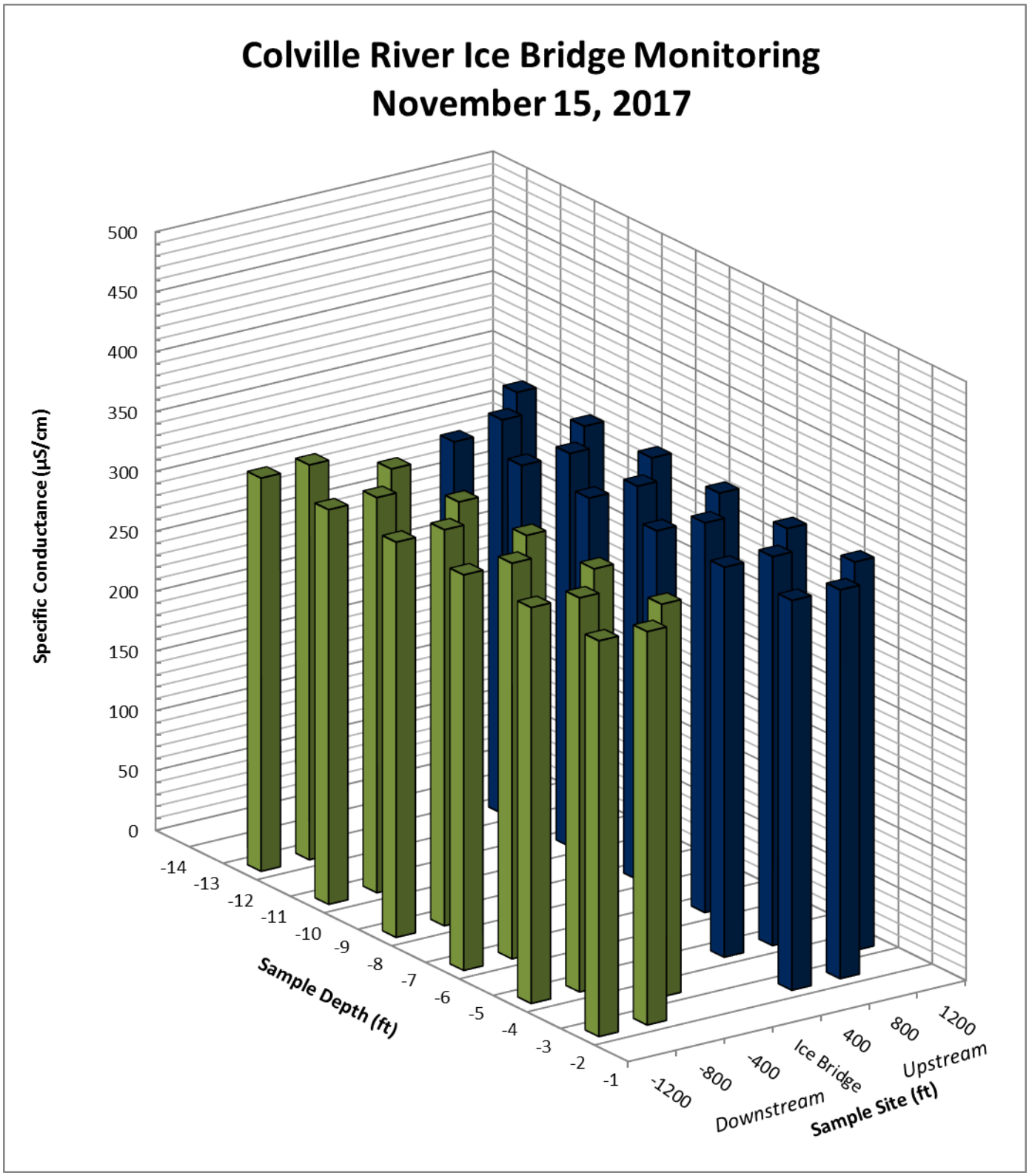
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **12:10 PM**	12.7	1.0	0.3	0.0	1	-	-	-	-	-	-	-
					2	0.0	166	325	10.88	74.5	0.2	-
					3	-	-	-	-	-	-	-
					4	0.0	166	326	10.91	74.7	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	168	329	10.91	74.9	0.2	-
					7	-	-	-	-	-	-	-
					8	0.1	168	328	10.98	75.4	0.2	-
					9	-	-	-	-	-	-	-
					10	0.2	169	328	11.10	76.4	0.2	-
					11	-	-	-	-	-	-	-
					12	0.4	166	320	11.37	78.7	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **11:50 AM**	13.2	1.2	0.2	0.0	1	-	-	-	-	-	-	-
					2	0.0	166	325	10.84	74.2	0.2	-
					3	-	-	-	-	-	-	-
					4	0.0	166	325	10.85	74.3	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	166	325	10.87	74.4	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	168	329	10.90	74.6	0.2	-
					9	-	-	-	-	-	-	-
					10	0.1	168	328	10.94	75.1	0.2	-
					11	-	-	-	-	-	-	-
					12	0.1	168	329	11.13	76.4	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **11:35 AM**	13.5	1.3	0.3	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	166	325	11.06	75.7	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	166	325	11.07	75.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	167	327	11.11	76.1	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	168	329	11.14	76.3	0.2	-
					10	-	-	-	-	-	-	-
					11	0.1	168	328	11.20	76.9	0.2	-
					12	-	-	-	-	-	-	-
					13	0.1	168	329	11.30	77.6	0.2	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **12:20 PM**	12.1	1.1	0.5	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	167	328	10.81	74.0	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	168	330	10.82	74.1	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	168	330	10.84	74.2	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	169	331	10.87	74.4	0.2	-
					10	-	-	-	-	-	-	-
					11	0.0	169	331	10.92	74.8	0.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **12:40 PM**	12.6	1.0	0.2	0.0	1	-	-	-	-	-	-	-
					2	0.0	168	328	10.82	74.1	0.2	-
					3	-	-	-	-	-	-	-
					4	0.0	168	329	10.82	74.1	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	169	330	10.84	74.2	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	169	331	10.87	74.4	0.2	-
					9	-	-	-	-	-	-	-
					10	0.1	169	330	10.91	74.9	0.2	-
					11	-	-	-	-	-	-	-
					12	0.2	170	330	11.02	75.9	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **12:50 PM**	12.4	1.1	0.2	0.0	1	-	-	-	-	-	-	-
					2	0.0	169	330	10.95	75.0	0.2	0.08
					3	-	-	-	-	-	-	-
					4	0.0	169	331	10.97	75.1	0.2	0.10
					5	-	-	-	-	-	-	-
					6	0.1	169	330	10.97	75.3	0.2	0.15
					7	-	-	-	-	-	-	-
					8	0.1	169	330	11.01	75.6	0.2	0.16
					9	-	-	-	-	-	-	-
					10	0.2	169	330	11.04	76.0	0.2	0.08
					11	-	-	-	-	-	-	-
					12	0.4	170	328	11.08	76.7	0.2	0.18
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 11/21/2017
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Shaun Piaskowski	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -1°F, 40 mph E wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, November 21 at 9:30 AM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support to the Colville. At 10:00 AM, Mr. Roe was briefed on UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 2:30 PM

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI Pro1030 meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. The YSI Professional 1030 meter was calibrated for conductivity and the DO meter was checked for accuracy and calibrated by TTT Environmental prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 314 microsiemens per centimeter (µS/cm) at 1,200 feet downstream to a maximum of 329 µS/cm at 800 feet downstream. SC was not greater than 500 µS/cm at any location.

The DO saturation ranged between 71.5 percent (%) and 74.5%, with an average of 72.1%.

Velocity measurements at 1,200 feet downstream of the ice bridge centerline could not be obtained because of inclement weather.

Ice thickness ranged between 1.2 feet to 1.4 feet; average ice thickness was 1.3 feet. Snow depth ranged from 0.0 feet to 0.3 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, November 29, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

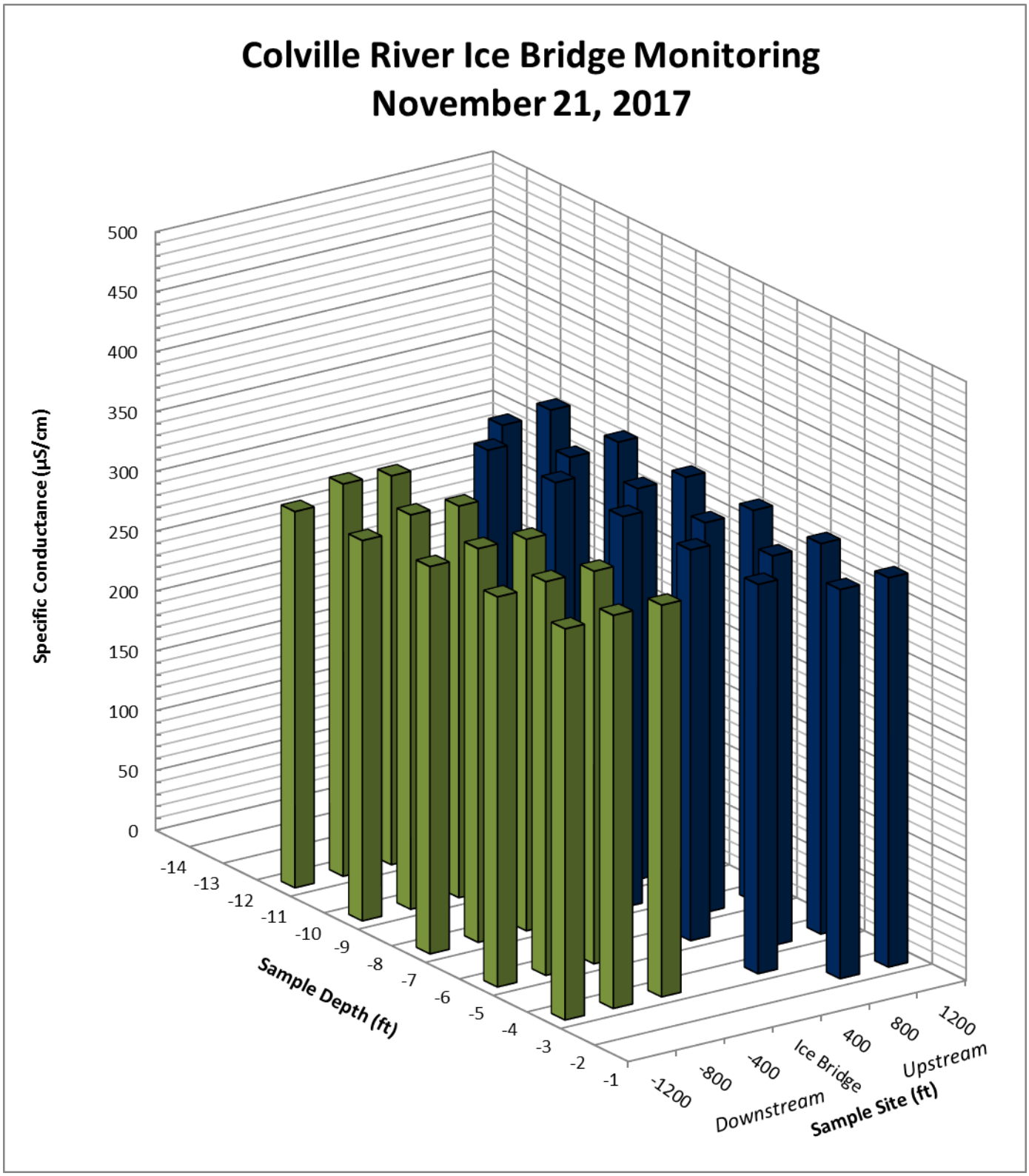
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **3:13 PM**	12.6	1.2	0.2	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	166	325	10.44	71.5	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	166	326	10.46	71.6	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	167	327	10.46	71.6	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	167	327	10.49	71.8	0.2	-
					10	-	-	-	-	-	-	-
					11	0.1	167	327	10.53	72.3	0.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **4:36 PM**	13.0	1.3	0.2	0.1	1	-	-	-	-	-	-	-
					2	0.0	166	325	10.47	71.7	0.2	-
					3	-	-	-	-	-	-	-
					4	0.0	166	325	10.47	71.7	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	167	326	10.46	71.8	0.2	-
					7	-	-	-	-	-	-	-
					8	0.1	167	327	10.49	72.0	0.2	-
					9	-	-	-	-	-	-	-
					10	0.2	167	325	10.56	72.7	0.2	-
					11	-	-	-	-	-	-	-
					12	0.4	168	324	10.64	73.7	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **4:40 PM**	13.3	1.3	0.2	0.1	1	-	-	-	-	-	-	-
					2	0.0	166	325	10.50	71.9	0.2	-
					3	-	-	-	-	-	-	-
					4	0.0	166	326	10.50	71.9	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	166	326	10.53	72.1	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	167	326	10.56	72.3	0.2	-
					9	-	-	-	-	-	-	-
					10	0.0	167	328	10.68	73.1	0.2	-
					11	-	-	-	-	-	-	-
					12	0.0	167	327	10.88	74.5	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **3:00 PM**	11.8	1.4	0.0	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	167	327	10.46	71.6	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	167	328	10.46	71.6	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	167	327	10.44	71.7	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	168	327	10.50	72.1	0.2	-
					10	-	-	-	-	-	-	-
					11	0.3	168	325	10.62	73.3	0.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **2:43 PM**	12.5	1.2	0.2	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	167	328	10.44	71.5	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	168	329	10.44	71.5	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	168	329	10.46	71.6	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	168	329	10.49	71.8	0.2	-
					10	-	-	-	-	-	-	-
					11	0.2	168	328	10.60	73.0	0.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **2:30 PM**	12.0	1.2	0.3	-0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.1	167	327	10.47	71.9	0.2	-
					4	-	-	-	-	-	-	-
					5	0.2	167	326	10.44	71.9	0.2	-
					6	-	-	-	-	-	-	-
					7	0.4	168	323	10.38	71.9	0.2	-
					8	-	-	-	-	-	-	-
					9	0.9	168	318	10.25	72.0	0.2	-
					10	-	-	-	-	-	-	-
					11	1.3	168	314	10.18	72.3	0.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity measurements at 1,200 feet downstream of the ice bridge centerline could not be obtained because of inclement weather.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 11/29/2017
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Clay Wells	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 0°F, 20mph E wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, November 28 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on November 29, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 12:05 PM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The YSI ProPlus meter was calibrated for conductivity and the YSI ProODO meter was calibrated for DO by TTT Environmental and checked for accuracy prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 330 microsiemens per centimeter (µS/cm) at 800 feet upstream to a maximum of 343 µS/cm at 1,200 feet downstream. SC was not greater than 500 µS/cm at any location.

The DO saturation ranged between 68.5 percent (%) and 72.4%, with an average of 69.6%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline was 0.0 ft/s throughout the water column. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 1.3 feet to 1.7 feet; average ice thickness was 1.5 feet. Snow depth ranged from 0.1 feet to 0.3 feet; average snow depth was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, December 6, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

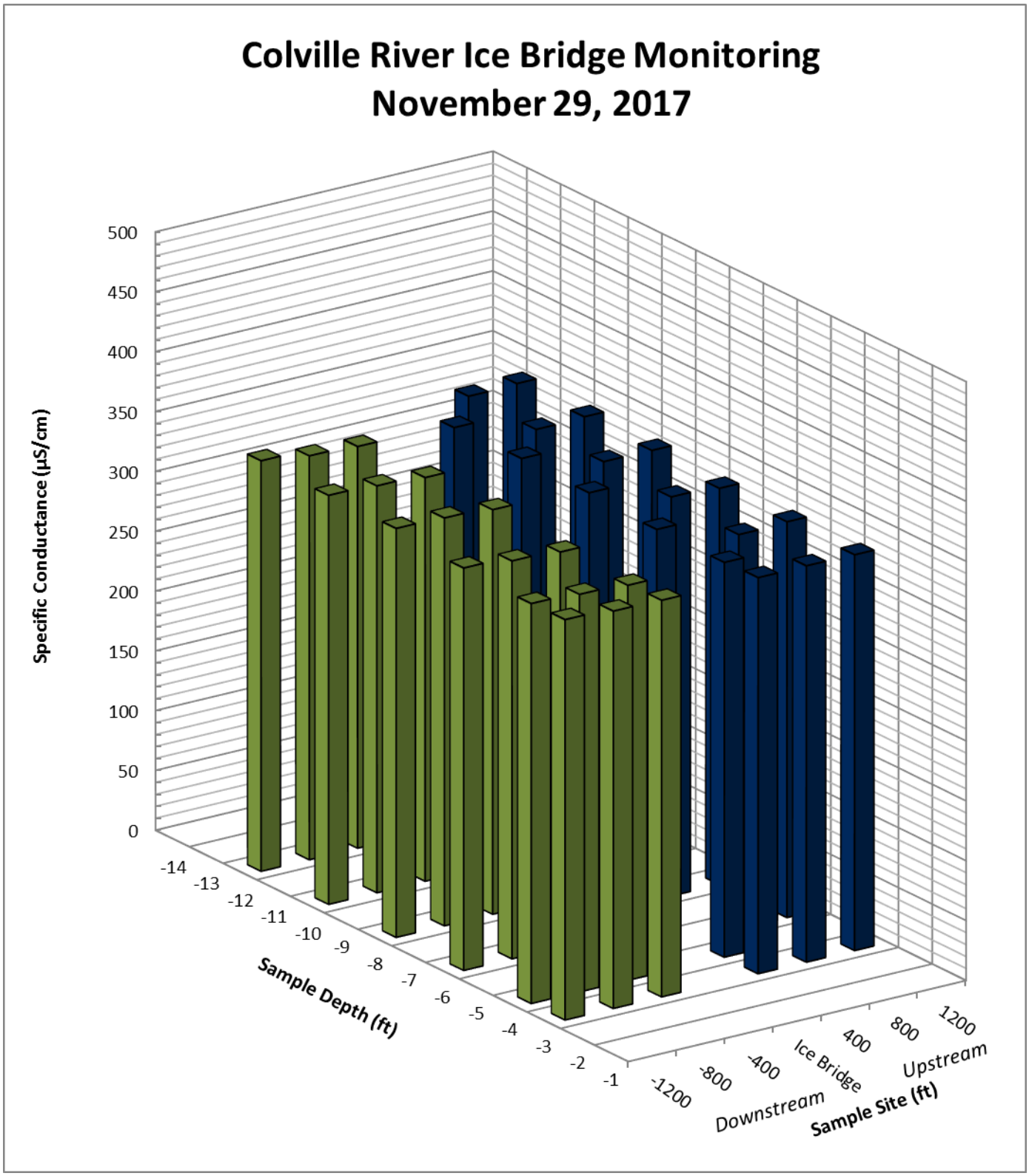
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **12:45 PM**	13.1	1.5	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	169	331	10.02	68.6	0.2	-
					4	0.1	169	330	10.02	68.8	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	169	330	10.05	69.0	0.2	-
					7	-	-	-	-	-	-	-
					8	0.2	171	333	10.05	69.2	0.2	-
					9	-	-	-	-	-	-	-
					10	0.4	173	334	10.04	69.5	0.2	-
					11	-	-	-	-	-	-	-
					12	0.6	173	332	10.05	70.0	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **12:30 PM**	13.4	1.6	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	169	331	10.00	68.5	0.2	-
					4	-	-	-	-	-	-	-
					5	0.1	169	330	9.99	68.6	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	171	333	10.02	68.8	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	172	335	10.03	68.9	0.2	-
					10	-	-	-	-	-	-	-
					11	0.3	173	335	9.98	68.9	0.2	-
					12	-	-	-	-	-	-	-
					13	0.5	174	335	10.01	69.5	0.2	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **12:05 PM**	13.6	1.6	0.1	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	169	331	10.02	68.6	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	169	331	10.05	68.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	169	331	10.06	68.9	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	171	335	10.06	68.9	0.2	-
					10	-	-	-	-	-	-	-
					11	0.0	171	336	10.08	69.0	0.2	-
					12	-	-	-	-	-	-	-
					13	0.0	171	336	10.43	71.4	0.2	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **1:00 PM**	12.3	1.7	0.1	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	169	331	10.06	68.9	0.2	-
					4	0.1	169	330	10.05	69.0	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	169	330	10.06	69.1	0.2	-
					7	-	-	-	-	-	-	-
					8	0.1	173	338	10.09	69.3	0.2	-
					9	-	-	-	-	-	-	-
					10	0.2	173	337	10.08	69.4	0.2	-
					11	-	-	-	-	-	-	-
					12	0.4	174	336	10.12	70.1	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **1:15 PM**	12.8	1.3	0.2	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	169	332	10.11	69.2	0.2	-
					4	0.0	169	332	10.12	69.3	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	170	332	10.12	69.3	0.2	-
					7	-	-	-	-	-	-	-
					8	0.1	174	341	10.12	69.5	0.2	-
					9	-	-	-	-	-	-	-
					10	0.2	175	340	10.14	69.8	0.2	-
					11	-	-	-	-	-	-	-
					12	0.5	175	337	10.14	70.4	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **2:10 PM**	12.4	1.4	0.3	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	171	334	10.34	70.8	0.2	0.00
					4	0.0	170	334	10.36	70.9	0.2	0.00
					5	-	-	-	-	-	-	-
					6	0.0	171	336	10.38	71.1	0.2	0.00
					7	-	-	-	-	-	-	-
					8	0.0	174	342	10.41	71.3	0.2	0.00
					9	-	-	-	-	-	-	-
					10	0.1	175	342	10.41	71.5	0.2	0.00
					11	-	-	-	-	-	-	-
					12	0.1	176	343	10.54	72.4	0.2	0.00
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 12/6/2017
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Clay Wells	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 0°F, 15 mph E wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, December 5 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 06:00 AM on December 6, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 11:13 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. The YSI ProPlus meter was calibrated for conductivity and the YSI ProODO meter was checked for accuracy the morning prior to sampling. The YSI ProODO meter was calibrated by TTT Environmental. Water velocity was measured using a HACH FH950 velocity meter.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 340 microsiemens per centimeter (µS/cm) at 800 feet downstream to a maximum of 357 µS/cm at 400 feet upstream. SC was not greater than 500 µS/cm at any location.

The DO saturation ranged between 58.6 percent (%) and 61.1%, with an average of 60.1%.

Velocities measured at 1,200 feet upstream of the ice bridge centerline ranged from a minimum of 0.11 feet per second (ft/s) in the downstream direction at a depth of 10 feet to a maximum of 0.25 ft/s in the downstream direction at a depth of 8 feet; average velocity was 0.18 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 1.5 feet to 1.9 feet; average ice thickness was 1.7 feet. Snow depth ranged from 0.0 feet to 0.3 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, December 13, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

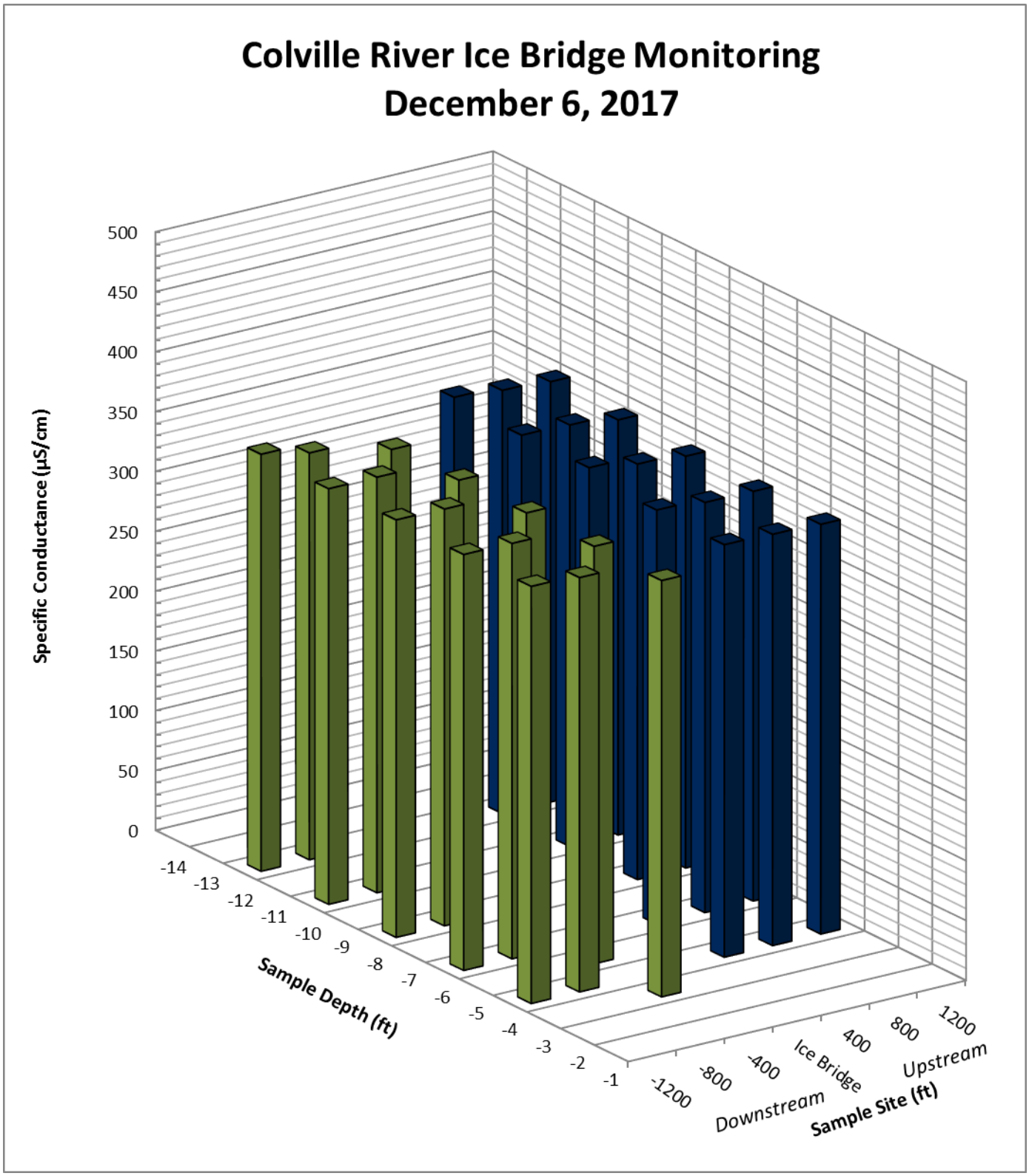
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **11:37 AM**	13.2	1.5	0.2	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	176	345	8.78	60.1	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	176	346	8.75	59.9	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	180	354	8.75	59.9	0.2	-
					9	-	-	-	-	-	-	-
					10	0.1	181	353	8.75	60.1	0.2	-
					11	-	-	-	-	-	-	-
					12	0.3	184	357	8.80	60.8	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **11:26 AM**	13.5	1.7	0.3	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	175	344	8.76	60.0	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	175	343	8.69	59.7	0.2	-
					7	-	-	-	-	-	-	-
					8	0.1	178	347	8.64	59.3	0.2	-
					9	-	-	-	-	-	-	-
					10	0.2	181	352	8.68	59.8	0.2	-
					11	-	-	-	-	-	-	-
					12	0.5	184	354	8.71	60.5	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **11:13 AM**	13.6	1.6	0.3	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.1	175	342	8.68	59.6	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	175	342	8.64	59.3	0.2	-
					7	-	-	-	-	-	-	-
					8	0.2	177	344	8.51	58.6	0.2	-
					9	-	-	-	-	-	-	-
					10	0.5	180	347	8.44	58.6	0.2	-
					11	-	-	-	-	-	-	-
					12	1.0	186	351	8.35	58.8	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:55 AM**	12.1	1.9	0.0	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	177	348	8.79	60.2	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	178	349	8.81	60.3	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	178	349	8.82	60.4	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	179	349	8.83	60.6	0.2	-
					10	-	-	-	-	-	-	-
					11	0.6	181	347	8.73	60.8	0.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **12:16 PM**	12.7	1.6	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.2	178	346	8.70	59.9	0.2	-
					5	-	-	-	-	-	-	-
					6	0.2	178	347	8.71	60.0	0.2	-
					7	-	-	-	-	-	-	-
					8	0.2	179	348	8.73	60.1	0.2	-
					9	-	-	-	-	-	-	-
					10	0.3	179	347	8.72	60.2	0.2	-
					11	-	-	-	-	-	-	-
					12	1.0	180	340	8.58	60.4	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **12:40 PM**	13.0	1.7	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.1	178	348	8.80	60.4	0.2	0.15
					5	-	-	-	-	-	-	-
					6	0.2	179	347	8.80	60.6	0.2	0.14
					7	-	-	-	-	-	-	-
					8	0.2	179	349	8.81	60.7	0.2	0.25
					9	-	-	-	-	-	-	-
					10	0.3	179	347	8.82	60.9	0.2	0.11
					11	-	-	-	-	-	-	-
					12	0.5	181	348	8.80	61.1	0.2	0.24
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 12/13/2017
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 10°F, 30 mph E wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, December 12 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 06:00 AM on December 13, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 10:40 AM

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI Pro1030 meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The YSI Professional 1030 meter was calibrated for conductivity and the DO meter was checked for accuracy and calibrated by TTT Environmental prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 327 microsiemens per centimeter (µS/cm) at 800 feet upstream to a maximum of 353 µS/cm at 1200 feet downstream. SC was not greater than 500 µS/cm at any location.

The DO saturation ranged between 59.1 percent (%) and 60.8%, with an average of 59.8%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.05 feet per second (ft/s) in the downstream direction at a depth of 7 feet to a maximum of 0.17 ft/s in the downstream direction at a depth of 9 feet; average velocity was 0.08 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 1.6 feet to 2.3 feet; average ice thickness was 2.0 feet. Snow depth ranged from 0.0 feet to 0.2 feet; average snow thickness was 0.1 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, December 20, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

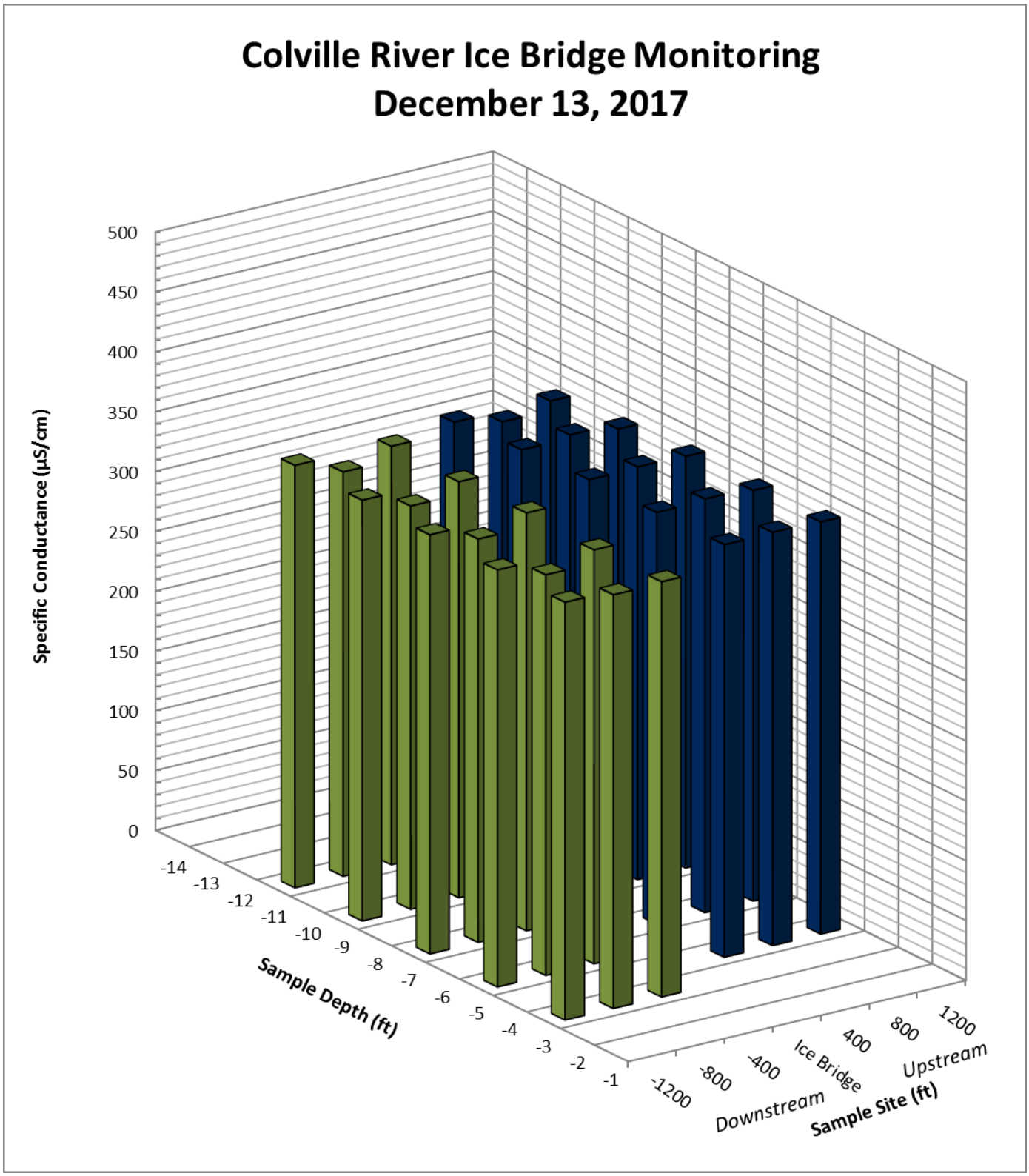
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:57 AM**	12.3	1.6	0.2	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.1	176	345	8.69	59.7	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	176	344	8.71	59.8	0.2	-
					7	-	-	-	-	-	-	-
					8	0.1	176	344	8.68	59.6	0.2	-
					9	-	-	-	-	-	-	-
					10	0.3	176	341	8.67	59.9	0.2	-
					11	-	-	-	-	-	-	-
					12	0.5	175	337	8.76	60.8	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:50 AM**	12.6	1.9	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.1	177	345	8.68	59.6	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	177	346	8.69	59.7	0.2	-
					7	-	-	-	-	-	-	-
					8	0.2	177	345	8.67	59.7	0.2	-
					9	-	-	-	-	-	-	-
					10	0.3	177	344	8.66	59.8	0.2	-
					11	-	-	-	-	-	-	-
					12	1.6	177	327	8.41	60.2	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **10:40 AM**	12.8	2.0	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.2	177	344	8.63	59.4	0.2	-
					5	-	-	-	-	-	-	-
					6	0.3	177	343	8.62	59.5	0.2	-
					7	-	-	-	-	-	-	-
					8	0.3	177	344	8.56	59.1	0.2	-
					9	-	-	-	-	-	-	-
					10	0.7	178	339	8.49	59.3	0.2	-
					11	-	-	-	-	-	-	-
					12	1.1	178	335	8.44	59.6	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:10 AM**	11.8	2.3	0.0	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	177	347	8.75	59.9	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	176	346	8.73	59.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	178	349	8.72	59.7	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	178	347	8.71	59.8	0.2	-
					10	-	-	-	-	-	-	-
					11	0.1	179	350	8.75	60.1	0.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:21 AM**	11.8	2.0	0.0	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.2	178	345	8.70	59.9	0.2	-
					4	-	-	-	-	-	-	-
					5	0.2	172	334	8.68	59.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.2	173	337	8.70	59.9	0.2	-
					8	-	-	-	-	-	-	-
					9	0.3	174	337	8.67	59.9	0.2	-
					10	-	-	-	-	-	-	-
					11	0.2	174	338	8.73	60.1	0.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **11:40 AM**	12.1	1.9	0.1	0.0	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	178	349	8.72	59.7	0.2	0.15
					4	-	-	-	-	-	-	-
					5	0.0	178	348	8.72	59.7	0.2	-0.13
					6	-	-	-	-	-	-	-
					7	0.0	179	350	8.72	59.7	0.2	0.05
					8	-	-	-	-	-	-	-
					9	0.0	179	351	8.75	59.9	0.2	0.17
					10	-	-	-	-	-	-	-
					11	0.0	180	353	8.79	60.2	0.2	0.14
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 12/20/2017
MICHAEL BAKER FIELD PERSONNEL: Devon Roe and Chris Siok	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Lance Hathaway	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 20°F, 15 mph SW wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, December 19 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 06:00 AM on December 20, Mr. Roe and Mr. Siok attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 1:10 PM

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI Pro1030 meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The YSI Professional 1030 meter was calibrated for conductivity and the DO meter was checked for accuracy and calibrated by TTT Environmental prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 364 microsiemens per centimeter (µS/cm) at 400 feet upstream to a maximum of 486 µS/cm at 1,200 feet downstream. SC was not greater than 500 µS/cm at any location.

The DO saturation ranged between 57.8 percent (%) and 59.3%, with an average of 58.4%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.05 feet per second (ft/s) in the upstream direction at a depth of 13 feet to a maximum of 0.17 ft/s in the upstream direction at a depth of 5 feet; average velocity was 0.10 ft/s in the upstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 1.6 feet to 2.1 feet; average ice thickness was 2.0 feet. Snow depth ranged from 0.1 feet to 0.2 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, December 27, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

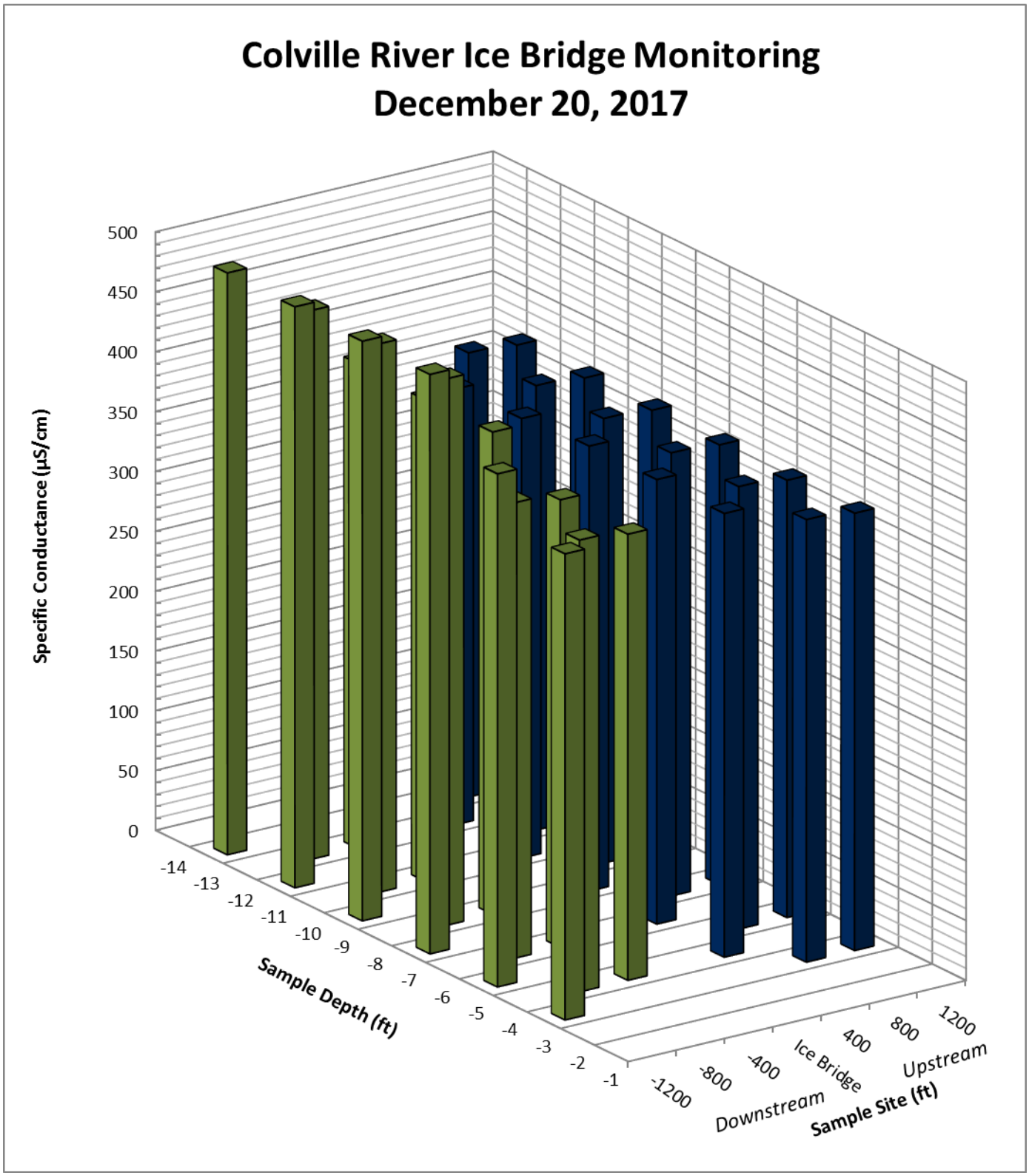
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **3:43 PM**	13.5	1.9	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	189	371	8.47	58.0	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	189	371	8.46	57.9	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	190	372	8.47	58.0	0.2	-
					9	-	-	-	-	-	-	-
					10	0.0	187	367	8.50	58.2	0.2	-
					11	-	-	-	-	-	-	-
					12	0.0	186	364	8.54	58.5	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **3:30 PM**	14.1	2.1	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	189	370	8.46	57.9	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	189	370	8.46	57.9	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	189	370	8.46	57.9	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	189	371	8.46	57.9	0.2	-
					10	-	-	-	-	-	-	-
					11	0.0	189	371	8.47	58.0	0.2	-
					12	-	-	-	-	-	-	-
					13	0.0	189	371	8.53	58.4	0.2	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **1:10 PM**	14.6	2.1	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	186	365	8.44	57.8	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	186	365	8.44	57.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	187	367	8.46	57.9	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	188	369	8.47	58.0	0.2	-
					10	-	-	-	-	-	-	-
					11	0.0	188	368	8.50	58.2	0.2	-
					12	-	-	-	-	-	-	-
					13	0.1	188	368	8.64	59.3	0.2	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **3:53 PM**	13.1	2.0	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	190	373	8.56	58.6	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	191	374	8.56	58.6	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	205	403	8.54	58.5	0.2	-
					9	-	-	-	-	-	-	-
					10	0.0	205	402	8.57	58.7	0.2	-
					11	-	-	-	-	-	-	-
					12	0.0	207	405	8.60	58.9	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **4:11 PM**	13.6	1.6	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	192	377	8.59	58.8	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	194	380	8.59	58.8	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	233	456	8.56	58.6	0.2	-
					9	-	-	-	-	-	-	-
					10	0.0	234	458	8.58	58.8	0.2	-
					11	-	-	-	-	-	-	-
					12	0.0	234	458	8.64	59.2	0.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **4:28 PM**	13.7	2.1	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	199	389	8.60	58.9	0.2	-0.13
					4	-	-	-	-	-	-	-
					5	0.0	219	428	8.59	58.8	0.2	-0.17
					6	-	-	-	-	-	-	-
					7	0.0	247	484	8.57	58.7	0.2	-0.14
					8	-	-	-	-	-	-	-
					9	0.0	247	484	8.57	58.7	0.2	-0.15
					10	-	-	-	-	-	-	-
					11	0.0	248	485	8.58	58.8	0.2	0.07
					12	-	-	-	-	-	-	-
					13	0.0	248	486	8.64	59.2	0.2	-0.05
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 12/27/2017
MICHAEL BAKER FIELD PERSONNEL: Chris Siok	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Lance Hathaway	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 13°F, 10 mph NE wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, December 26 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on December 27, Mr. Siok attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 10:06 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI Pro1030 meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The YSI Professional 1030 meter was calibrated for conductivity and the DO meter was checked for accuracy and calibrated by TTT Environmental prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 221 microsiemens per centimeter (µS/cm) at 800 feet upstream to a maximum of 4,646 µS/cm at 800 feet downstream.

The DO saturation ranged between 53.5 percent (%) and 59.5%, with an average of 55.2%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at a depth of 12 feet to a maximum of 0.14 ft/s in the downstream direction at depths of 6 and 8 feet; average velocity was 0.09 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 2.0 feet to 2.4 feet; average ice thickness was 2.2 feet. Snow depth ranged from 0.1 feet to 0.3 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, January 3, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

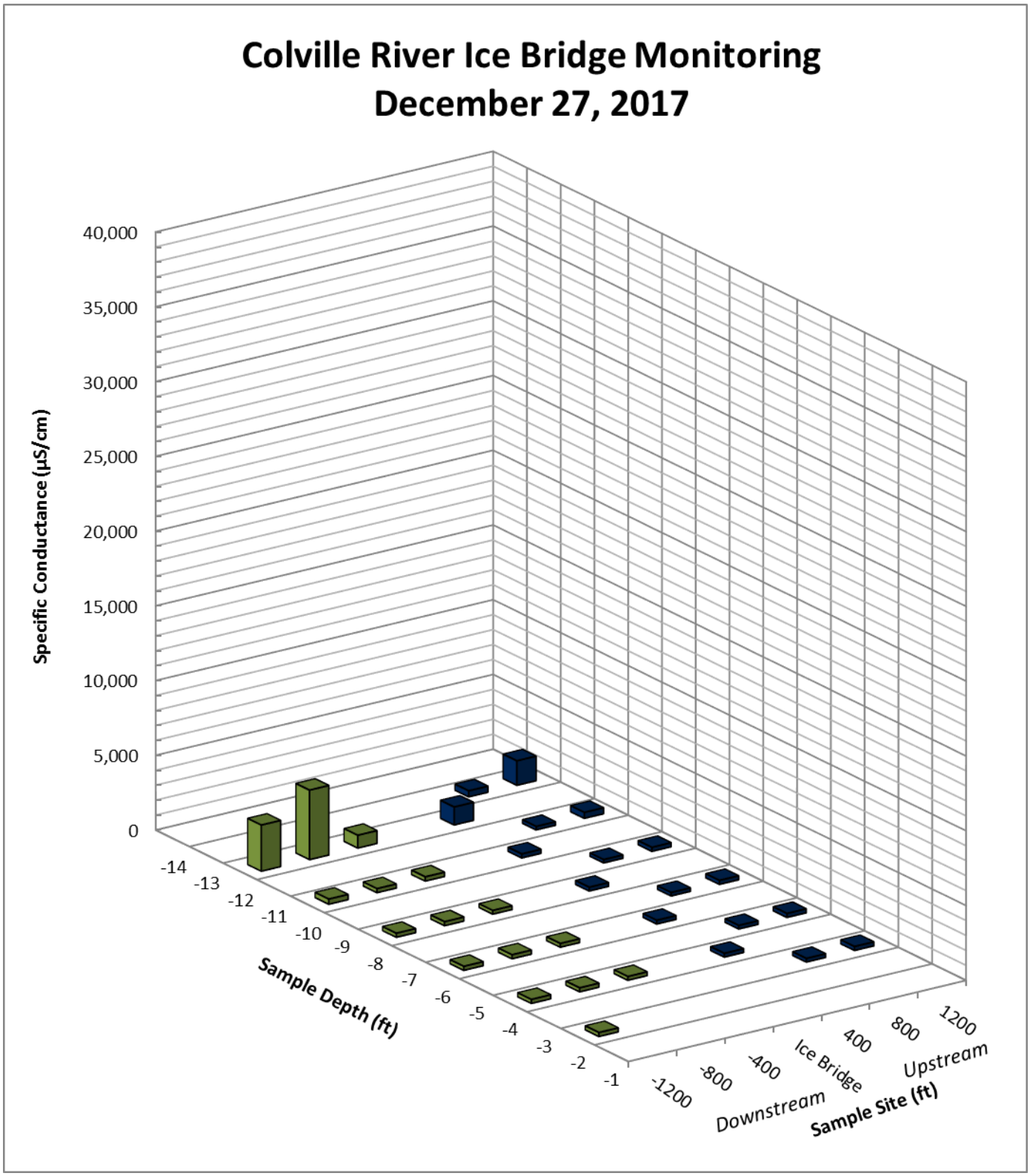
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:43 AM**	13.1	2.1	0.2	0.8	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	129	252	7.83	53.6	0.1	-
					5	-	-	-	-	-	-	-
					6	0.0	128	251	7.85	53.7	0.1	-
					7	-	-	-	-	-	-	-
					8	0.0	128	251	7.96	54.5	0.1	-
					9	-	-	-	-	-	-	-
					10	0.0	137	268	8.14	55.7	0.1	-
					11	-	-	-	-	-	-	-
					12	0.2	616	1199	8.54	59.0	0.6	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:23 AM**	13.7	2.2	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	124	243	7.83	53.6	0.1	-
					4	-	-	-	-	-	-	-
					5	0.0	121	237	7.85	53.7	0.1	-
					6	-	-	-	-	-	-	-
					7	0.0	118	230	7.88	53.9	0.1	-
					8	-	-	-	-	-	-	-
					9	0.0	113	221	7.92	54.2	0.1	-
					10	-	-	-	-	-	-	-
					11	0.0	118	230	8.23	56.3	0.1	-
					12	-	-	-	-	-	-	-
					13	0.1	207	404	8.62	59.2	0.2	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **10:06 AM**	14.0	2.4	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	135	265	7.86	53.8	0.1	-
					4	-	-	-	-	-	-	-
					5	0.0	135	265	7.87	53.9	0.1	-
					6	-	-	-	-	-	-	-
					7	0.0	135	265	7.90	54.1	0.1	-
					8	-	-	-	-	-	-	-
					9	0.0	136	266	7.98	54.6	0.1	-
					10	-	-	-	-	-	-	-
					11	0.1	202	395	8.27	56.8	0.2	-
					12	-	-	-	-	-	-	-
					13	0.8	861	1638	8.40	59.1	0.8	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:01 AM**	12.7	2.2	0.1	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	128	250	7.82	53.5	0.1	-
					5	-	-	-	-	-	-	-
					6	0.0	126	248	7.85	53.7	0.1	-
					7	-	-	-	-	-	-	-
					8	0.0	126	246	7.89	54.0	0.1	-
					9	-	-	-	-	-	-	-
					10	0.0	144	283	8.17	55.9	0.1	-
					11	-	-	-	-	-	-	-
					12	0.4	443	855	8.58	59.5	0.4	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:18 AM**	13.0	2.0	0.3	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	135	265	7.83	53.6	0.1	-
					5	-	-	-	-	-	-	-
					6	0.0	136	266	7.86	53.8	0.1	-
					7	-	-	-	-	-	-	-
					8	0.0	136	266	7.95	54.4	0.1	-
					9	-	-	-	-	-	-	-
					10	0.0	136	267	8.05	55.1	0.1	-
					11	-	-	-	-	-	-	-
					12	0.4	2406	4646	8.01	56.3	2.4	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **11:38 AM**	13.1	2.1	0.2	0.2	1	-	-	-	-	-	-	-
					2	0.0	135	265	7.87	53.9	0.1	0.03
					3	-	-	-	-	-	-	-
					4	0.0	136	266	7.90	54.1	0.1	0.12
					5	-	-	-	-	-	-	-
					6	0.0	136	266	7.93	54.3	0.1	0.14
					7	-	-	-	-	-	-	-
					8	0.0	137	268	8.02	54.9	0.1	0.14
					9	-	-	-	-	-	-	-
					10	0.1	175	342	8.20	56.3	0.2	0.13
					11	-	-	-	-	-	-	-
					12	0.5	1603	3084	8.26	57.9	1.5	0.00
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 1/3/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Clay Wells	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 0°F, 5 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, January 2 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on January 3, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River on snow machines and began sampling at 11:00 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI Pro1030 meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The YSI Professional 1030 meter was calibrated for conductivity and the DO meter was checked for accuracy and calibrated by TTT Environmental prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 372 microsiemens per centimeter (µS/cm) at 800 feet downstream to a maximum of 11,834 µS/cm at 1,200 feet downstream.

The DO saturation ranged between 49.2 percent (%) and 62.6%, with an average of 51.5%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.02 feet per second (ft/s) in the downstream direction at a depth of 10 feet to a maximum of 0.11 ft/s in the downstream direction at a depth of 12 feet; average velocity was 0.02 ft/s in the upstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 2.2 feet to 2.7 feet; average ice thickness was 2.4 feet. Snow depth ranged from 0.0 feet to 0.5 feet; average snow depth was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, January 10, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

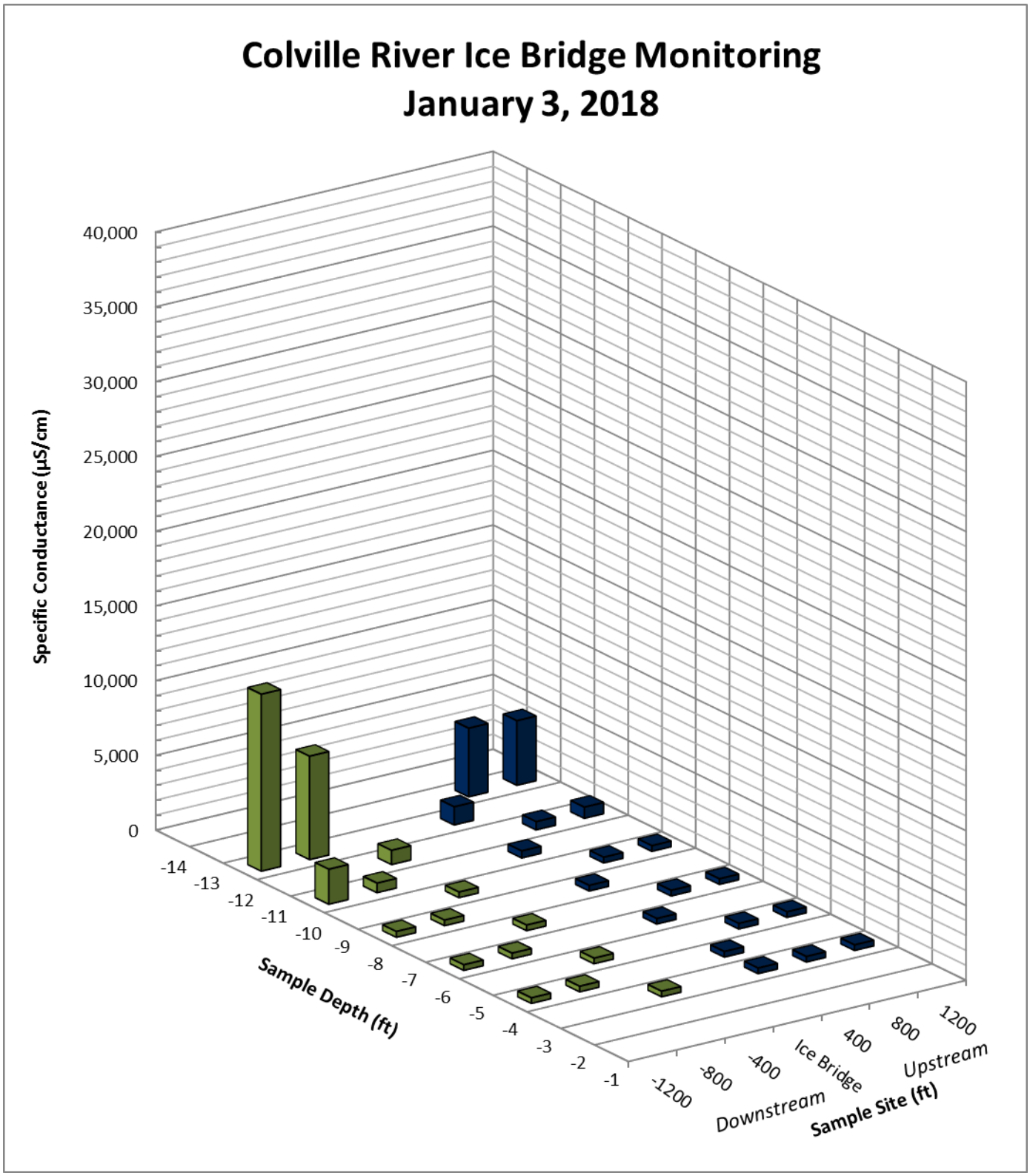
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **11:45 AM**	13.6	2.2	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	190	372	7.18	49.2	0.2	-
					4	0.0	190	372	7.20	49.3	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	190	372	7.24	49.6	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	191	374	7.30	50.0	0.2	-
					9	-	-	-	-	-	-	-
					10	0.2	241	470	7.52	51.8	0.2	-
					11	-	-	-	-	-	-	-
					12	0.4	628	1213	7.99	55.5	0.6	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **11:20 AM**	13.8	2.5	0.4	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	190	373	7.20	49.3	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	190	373	7.21	49.4	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	190	373	7.24	49.6	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	193	379	7.33	50.2	0.2	-
					10	-	-	-	-	-	-	-
					11	0.2	283	551	7.76	53.5	0.3	-
					12	-	-	-	-	-	-	-
					13	0.5	2387	4592	8.31	58.6	2.4	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **11:00 AM**	14.2	2.4	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	190	373	7.46	51.1	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	190	373	7.51	51.4	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	191	374	7.59	52.0	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	195	380	7.78	53.4	0.2	-
					10	-	-	-	-	-	-	-
					11	0.2	384	748	8.14	56.1	0.4	-
					12	-	-	-	-	-	-	-
					13	0.6	2255	4322	8.86	62.6	2.2	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **12:00 PM**	12.5	2.7	0.0	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	190	373	7.20	49.3	0.2	-
					4	-	-	-	-	-	-	-
					5	0.0	190	373	7.20	49.3	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	190	373	7.21	49.4	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	191	372	7.28	50.0	0.2	-
					10	-	-	-	-	-	-	-
					11	0.3	490	950	7.54	52.2	0.5	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **12:15 PM**	13.3	2.5	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	190	372	7.20	49.3	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	191	374	7.21	49.4	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	191	375	7.27	49.8	0.2	-
					9	-	-	-	-	-	-	-
					10	0.1	326	637	7.59	52.2	0.3	-
					11	-	-	-	-	-	-	-
					12	0.5	3595	6916	7.32	52.1	3.6	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **12:30 PM**	12.9	2.2	0.5	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	190	372	7.23	49.5	0.2	-0.05
					5	-	-	-	-	-	-	-
					6	0.0	190	372	7.21	49.4	0.2	-0.08
					7	-	-	-	-	-	-	-
					8	0.0	197	385	7.36	50.4	0.2	-0.09
					9	-	-	-	-	-	-	-
					10	0.2	1202	2339	7.38	51.2	1.2	0.02
					11	-	-	-	-	-	-	-
					12	0.3	6105	11834	7.43	53.6	6.4	0.11
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 1/10/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -20°F, 5 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, January 9 at 6:15 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on January 10, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:20 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 375 microsiemens per centimeter (µS/cm) at 800 feet upstream to a maximum of 6,556 µS/cm at 800 feet downstream.

The DO saturation ranged between 47.3 percent (%) and 59.8%, with an average of 52.3%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.02 feet per second (ft/s) in the upstream direction at a depth of 12 feet to a maximum of 0.14 ft/s in the downstream direction at a depth of 8 feet; average velocity was 0.07 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 2.5 feet to 3.0 feet; average ice thickness was 2.8 feet. Snow depth ranged from 0.0 feet to 0.6 feet; average snow depth was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, January 17, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

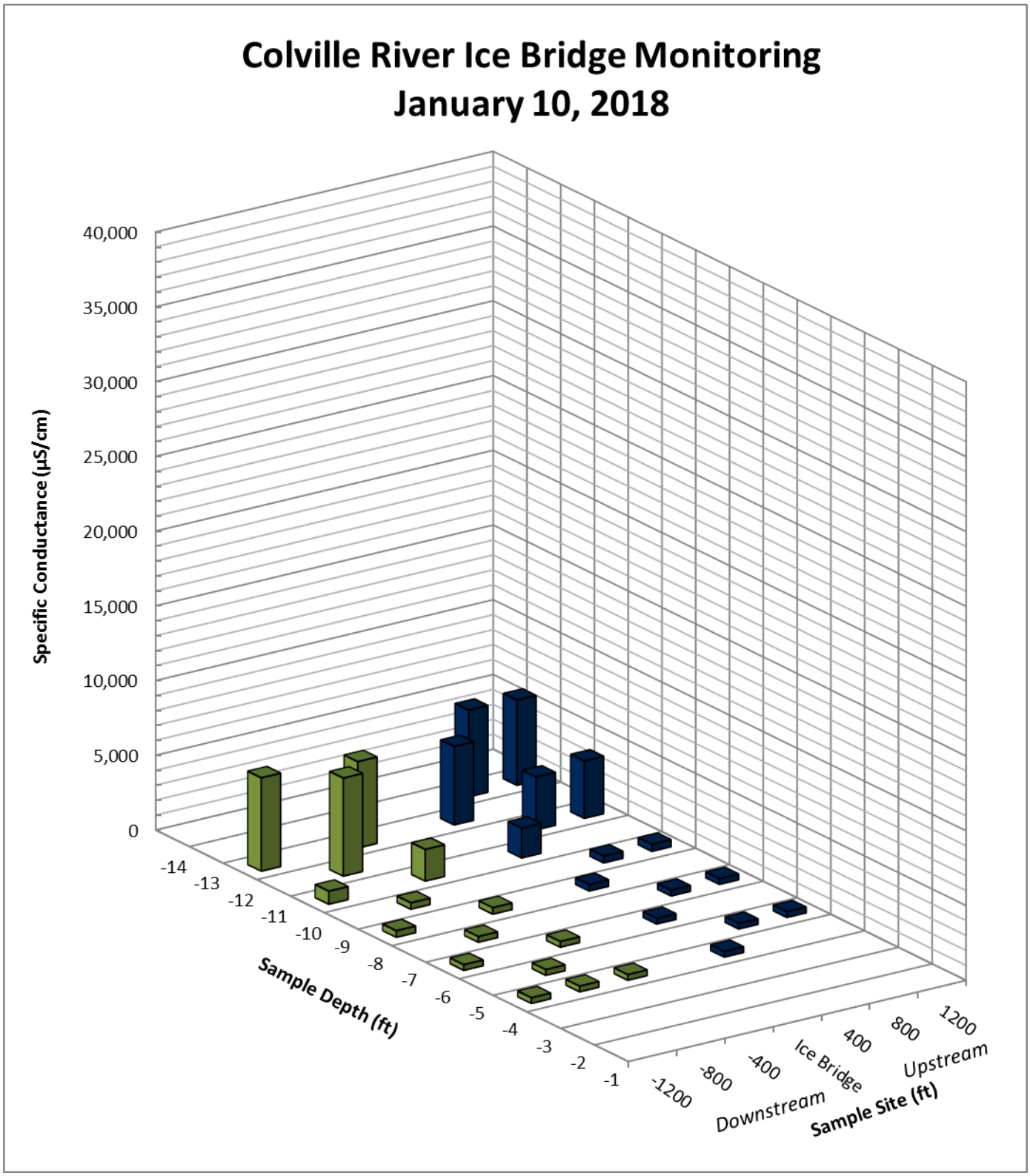
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:00 AM**	13.3	2.8	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	192	376	7.01	48.0	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	193	378	7.10	48.6	0.2	-
					7	-	-	-	-	-	-	-
					8	0.1	223	436	7.28	50.0	0.2	-
					9	-	-	-	-	-	-	-
					10	0.3	1027	1991	8.11	56.3	1.0	-
					11	-	-	-	-	-	-	-
					12	1.4	2817	5242	7.84	56.8	2.7	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **9:40 AM**	13.9	2.5	0.6	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	191	375	6.91	47.3	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	193	378	6.92	47.4	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	233	457	7.10	48.6	0.2	-
					10	-	-	-	-	-	-	-
					11	0.2	1817	3536	8.24	57.4	1.8	-
					12	-	-	-	-	-	-	-
					13	0.4	3003	5799	8.14	57.5	3.0	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:20 AM**	14.0	2.7	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	192	376	7.16	49.0	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	194	381	7.27	49.8	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	239	468	7.92	54.4	0.2	-
					10	-	-	-	-	-	-	-
					11	0.5	1994	3836	8.51	59.8	1.9	-
					12	-	-	-	-	-	-	-
					13	1.5	3073	5697	8.01	58.3	3.0	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:00 AM**	13.4	3.0	0.0	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	193	378	7.23	49.5	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	194	380	7.29	49.9	0.2	-
					7	-	-	-	-	-	-	-
					8	0.2	222	433	7.42	51.1	0.2	-
					9	-	-	-	-	-	-	-
					10	0.7	1109	2118	8.37	58.8	1.0	-
					11	-	-	-	-	-	-	-
					12	1.4	3105	5777	7.58	55.0	2.9	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:20 AM**	12.6	2.7	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	193	379	7.07	48.4	0.2	-
					5	0.0	193	379	7.13	48.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	195	382	7.32	50.1	0.2	-
					8	-	-	-	-	-	-	-
					9	0.2	219	425	7.97	54.9	0.2	-
					10	-	-	-	-	-	-	-
					11	0.5	3408	6556	7.66	54.4	3.4	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **11:40 AM**	13.0	2.8	0.3	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	193	379	7.14	48.9	0.2	0.03
					5	-	-	-	-	-	-	-
					6	0.0	193	378	7.18	49.2	0.2	0.06
					7	-	-	-	-	-	-	-
					8	0.1	222	433	7.38	50.7	0.2	0.14
					9	-	-	-	-	-	-	-
					10	0.2	446	868	7.99	55.1	0.4	0.12
					11	-	-	-	-	-	-	-
					12	0.4	3232	6241	7.75	54.8	3.2	-0.02
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 1/17/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 15°F, 15 mph E wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, January 16 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 06:00 AM on January 17, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:25 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 686 microsiemens per centimeter (µS/cm) at 800 feet downstream to a maximum of 24,901 µS/cm at 1,200 feet downstream.

The DO saturation ranged between 45.8 percent (%) and 61.4%, with an average of 52.1%.

Velocities measured at 1,200 feet upstream of the ice bridge centerline ranged from a minimum of 0.01 feet per second (ft/s) in the upstream direction at a depth of 13 feet to a maximum of 0.12 ft/s in the downstream direction at a depth of 9 feet; average velocity was 0.02 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 2.5 feet to 3.3 feet; average ice thickness was 2.9 feet. Snow depth ranged from 0.1 feet to 0.2 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, January 24, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

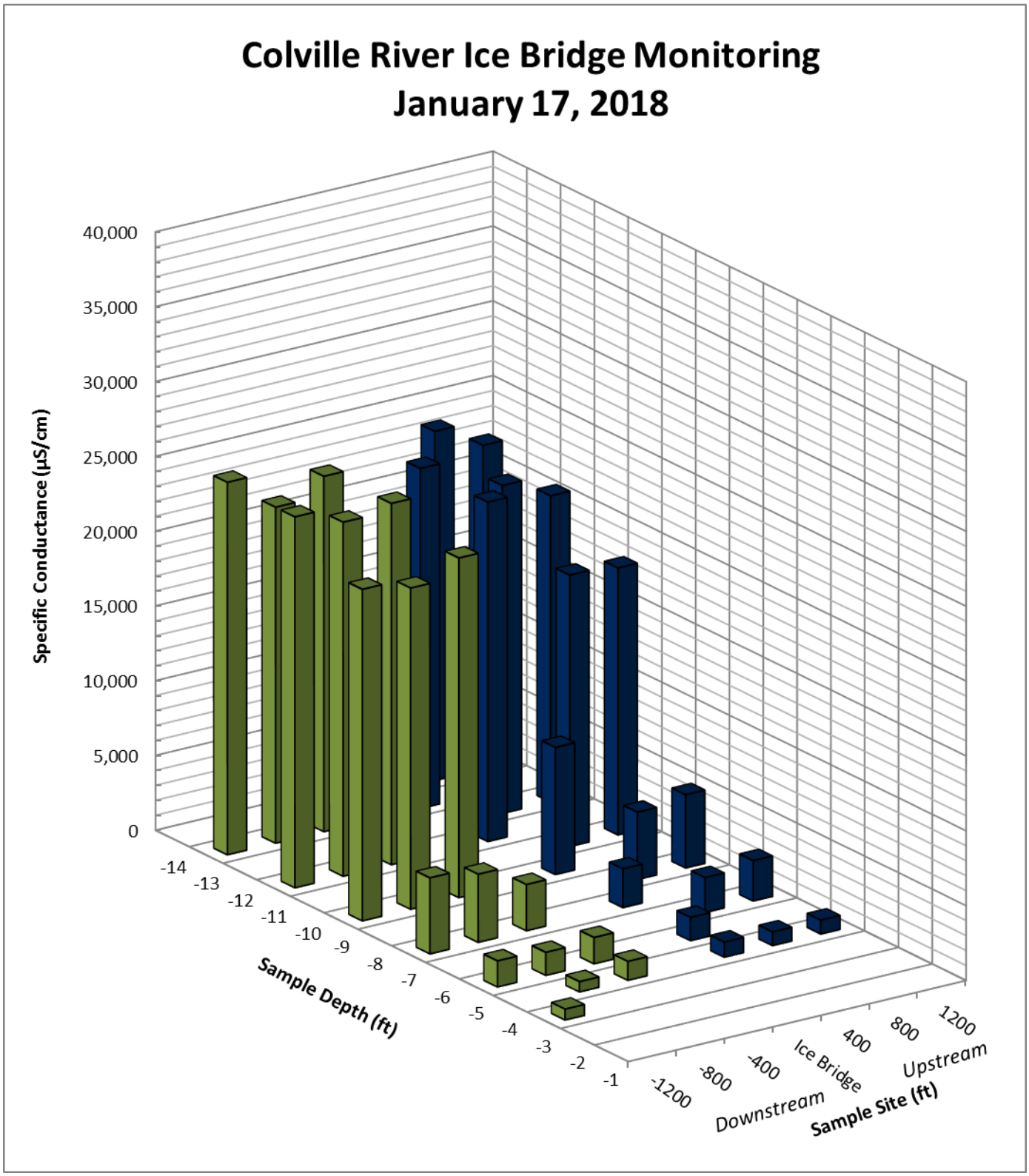
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:00 AM**	14.1	2.5	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	516	1012	6.67	45.8	0.5	-
					5	0.0	793	1555	6.73	46.3	0.7	-
					6	-	-	-	-	-	-	-
					7	0.1	1326	2590	6.89	47.7	1.3	-
					8	-	-	-	-	-	-	-
					9	0.3	4385	8500	7.12	50.7	4.5	-
					10	-	-	-	-	-	-	-
					11	0.4	11751	22692	7.34	55.5	12.9	-
					12	-	-	-	-	-	-	-
					13	0.4	11775	22739	7.68	58.1	12.9	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **9:43 AM**	14.4	2.8	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.1	468	914	6.67	45.9	0.4	-
					5	-	-	-	-	-	-	-
					6	0.1	1196	2336	6.81	47.1	1.1	-
					7	-	-	-	-	-	-	-
					8	0.2	2314	4503	6.98	48.8	2.3	-
					9	-	-	-	-	-	-	-
					10	0.4	9397	18147	7.21	53.5	10.1	-
					11	-	-	-	-	-	-	-
					12	0.4	11356	21930	7.36	55.5	12.4	-
					13	-	-	-	-	-	-	-
					14	0.4	12091	23349	7.58	57.5	13.3	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:25 AM**	14.3	3.0	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.1	477	932	6.70	46.1	0.4	-
					5	-	-	-	-	-	-	-
					6	0.1	1382	2699	6.78	46.9	1.3	-
					7	-	-	-	-	-	-	-
					8	0.2	2517	4898	6.86	48.0	2.5	-
					9	-	-	-	-	-	-	-
					10	0.5	9280	17853	7.10	52.8	10.0	-
					11	-	-	-	-	-	-	-
					12	0.7	10721	20471	7.22	54.6	11.6	-
					13	-	-	-	-	-	-	-
					14	0.8	11376	21641	7.39	56.3	12.3	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI ProPlus meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **10:27 AM**	13.6	3.3	0.1	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	646	1267	6.77	46.5	0.6	-
					5	0.1	900	1758	6.84	47.2	0.9	-
					6	-	-	-	-	-	-	-
					7	0.2	1588	3090	6.99	48.6	1.5	-
					8	-	-	-	-	-	-	-
					9	0.4	11758	22706	7.55	57.1	12.9	-
					10	-	-	-	-	-	-	-
					11	0.4	12505	24148	7.72	58.8	13.8	-
					12	-	-	-	-	-	-	-
					13	0.3	12256	23757	8.10	61.4	13.6	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **10:46 AM**	13.8	3.0	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	350	686	6.78	46.5	0.3	-
					5	0.1	788	1539	6.88	47.4	0.7	-
					6	-	-	-	-	-	-	-
					7	0.2	2339	4551	7.24	50.6	2.3	-
					8	-	-	-	-	-	-	-
					9	0.3	11075	21468	7.63	57.3	12.1	-
					10	-	-	-	-	-	-	-
					11	0.4	12255	23666	7.76	59.0	13.5	-
					12	-	-	-	-	-	-	-
					13	0.3	11589	22465	7.92	59.7	12.8	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **11:07 AM**	13.9	2.9	0.1	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	0.0	370	726	6.78	46.5	0.3	-0.09
					4	-	-	-	-	-	-	-
					5	0.1	892	1742	6.80	46.9	0.8	0.03
					6	-	-	-	-	-	-	-
					7	0.1	2600	5079	7.18	50.1	2.6	-0.02
					8	-	-	-	-	-	-	-
					9	0.4	11473	22155	7.62	57.5	12.6	0.12
					10	-	-	-	-	-	-	-
					11	0.4	12840	24795	7.74	59.1	14.2	0.07
					12	-	-	-	-	-	-	-
					13	0.2	12797	24901	7.85	59.6	14.1	-0.01
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI ProPlus meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 1/24/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Ryan Rencehausen	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -30°F, 10 mph W wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Wednesday, January 24 at 12:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 1:00 PM Mr. Roe and UMIAQ personnel conducted a health and safety meeting then traveled to the Colville River via Hägglund tracked vehicle. Sampling began at 2:08 PM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 393 microsiemens per centimeter (µS/cm) at 1,200 feet upstream to a maximum of 21,429 µS/cm at 800 feet downstream.

The DO saturation ranged between 43.8 percent (%) and 61.9%, with an average of 49.2%.

Velocities measured at 1,200 feet upstream of the ice bridge centerline ranged from a minimum of 0.01 feet per second (ft/s) in the upstream direction at a depth of 12 feet to a maximum of 0.16 ft/s in the downstream direction at a depth of 6 feet; average velocity was 0.03 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 3.1 feet to 3.4 feet; average ice thickness was 3.2 feet. Snow depth ranged from 0.0 feet to 0.2 feet; average snow depth was 0.1 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, January 31, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

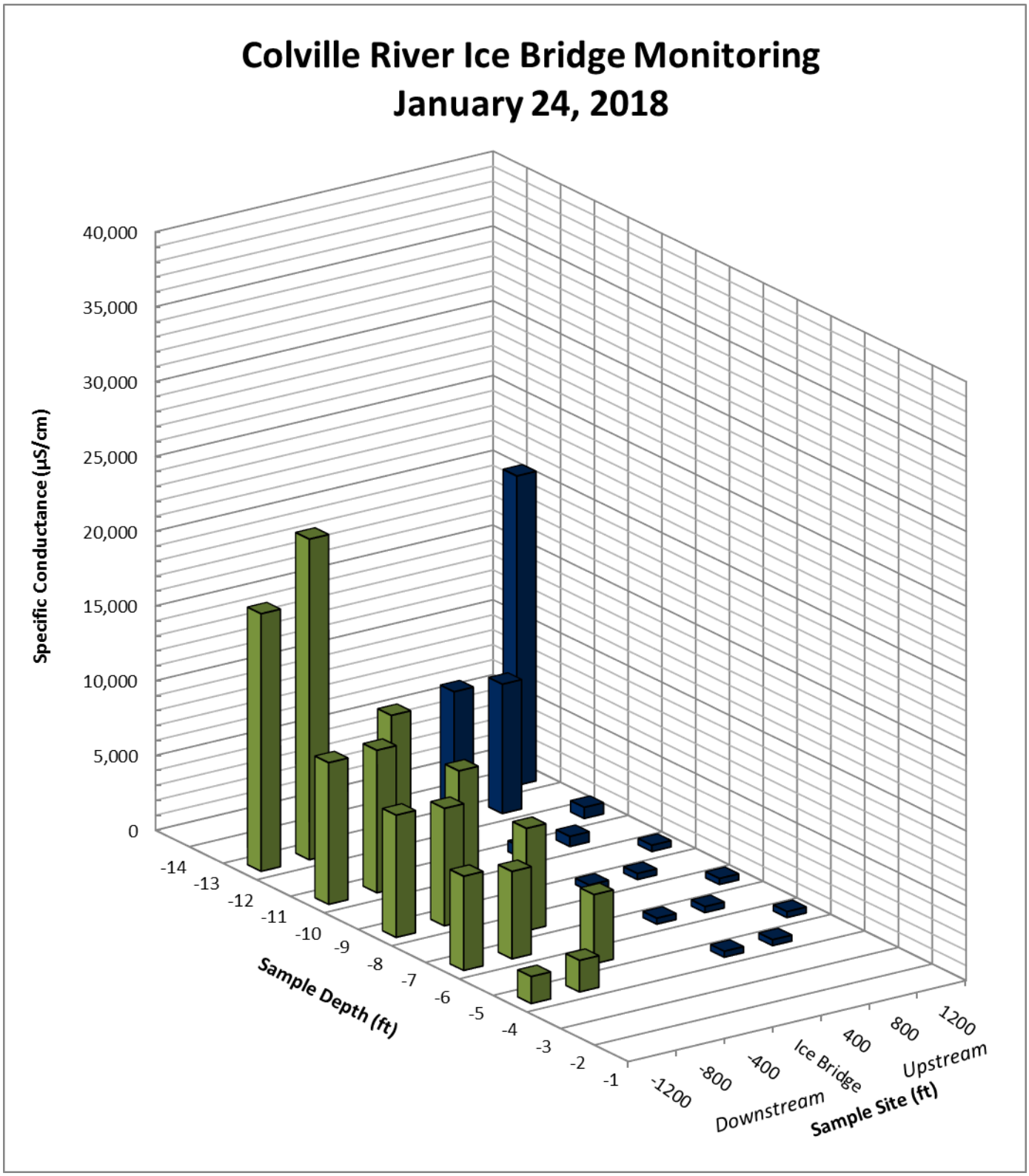
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **2:38 PM**	12.8	3.1	0.1	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	202	395	6.44	44.1	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	202	397	6.48	44.4	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	207	406	6.57	45.0	0.2	-
					9	-	-	-	-	-	-	-
					10	0.1	366	714	7.05	48.5	0.3	-
					11	-	-	-	-	-	-	-
					12	0.6	4650	8912	7.50	53.9	4.7	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **2:22 PM**	13.3	3.2	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	201	394	6.45	44.2	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	203	398	6.50	44.5	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	206	403	6.59	45.1	0.2	-
					9	-	-	-	-	-	-	-
					10	0.1	344	673	6.82	46.9	0.3	-
					11	-	-	-	-	-	-	-
					12	0.6	4510	8644	7.40	53.1	4.5	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **2:08 PM**	13.8	3.2	0.1	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	200	393	6.40	43.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	204	399	6.45	44.2	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	212	415	6.59	45.1	0.2	-
					10	-	-	-	-	-	-	-
					11	0.2	380	740	7.03	48.5	0.3	-
					12	-	-	-	-	-	-	-
					13	1.5	11162	20693	7.20	55.7	11.8	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **2:56 PM**	12.2	3.4	0.1	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	2367	4623	6.87	47.9	2.4	-
					6	-	-	-	-	-	-	-
					7	0.2	3515	6840	7.03	49.6	3.6	-
					8	-	-	-	-	-	-	-
					9	0.2	4355	8474	7.16	50.8	4.5	-
					10	-	-	-	-	-	-	-
					11	0.5	5187	9979	7.32	52.7	5.3	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **3:15 PM**	12.4	3.1	0.1	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	1074	2106	6.84	47.1	1.0	-
					5	-	-	-	-	-	-	-
					6	0.1	2990	5840	7.11	49.8	3.0	-
					7	-	-	-	-	-	-	-
					8	0.2	4032	7846	7.32	51.8	4.1	-
					9	-	-	-	-	-	-	-
					10	0.3	4912	9522	7.30	52.2	5.1	-
					11	-	-	-	-	-	-	-
					12	0.7	11223	21429	8.16	61.9	12.1	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **3:40 PM**	13.3	3.4	0.0	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	917	1798	7.01	48.2	0.9	0.04
					5	-	-	-	-	-	-	-
					6	0.1	3222	6293	6.94	48.7	3.3	0.16
					7	-	-	-	-	-	-	-
					8	0.2	4197	8167	7.11	50.4	4.3	0.03
					9	-	-	-	-	-	-	-
					10	0.2	4864	9465	7.40	52.7	5.0	-0.05
					11	-	-	-	-	-	-	-
					12	0.7	9015	17213	7.63	56.9	9.6	-0.01
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 1/31/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Roy Baldwin	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -2°F, 5-10 mph W wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, January 30 at 5:30 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM Ms. Runa attended UMIAQ's daily health and safety meeting. Ms. Runa and UMIAQ personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 10:35 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 388 microsiemens per centimeter (µS/cm) at 400 feet upstream to a maximum of 20,837 µS/cm at 1,200 feet downstream.

The DO saturation ranged between 43.7 percent (%) and 59.1%, with an average of 47.9%.

Velocities measured at 1,200 feet upstream of the ice bridge centerline ranged from a minimum of 0.01 feet per second (ft/s) in the downstream direction at a depth of 4 and 6 feet to a maximum of 0.04 ft/s in the downstream direction at a depth of 8 feet; average velocity was 0.01 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 2.7 feet to 3.5 feet; average ice thickness was 3.1 feet. Snow depth ranged from 0.2 feet to 0.4 feet; average snow depth was 0.3 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, February 7, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

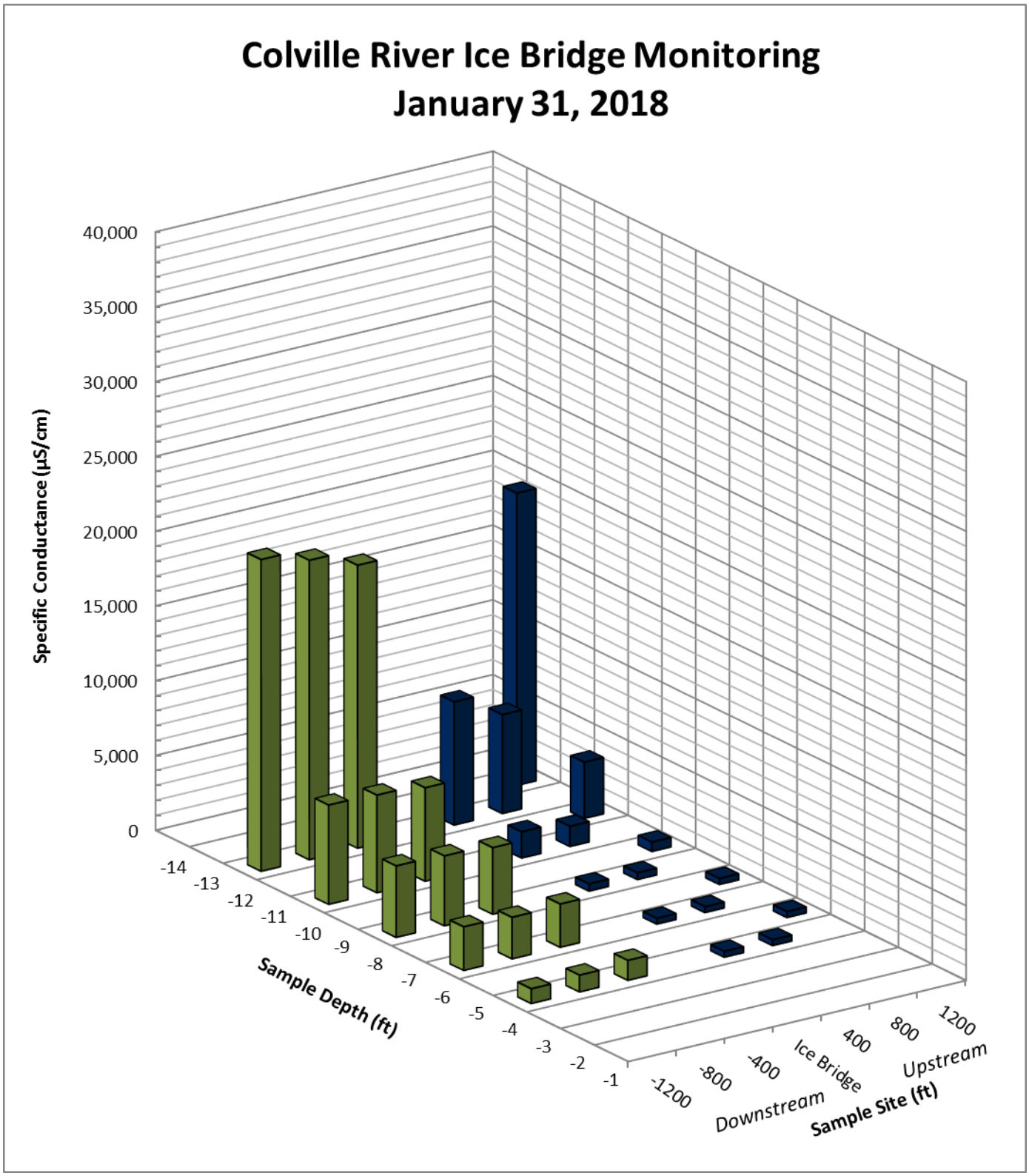
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **11:15 AM**	12.9	2.8	0.4	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	198	388	6.45	44.2	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	200	393	6.48	44.4	0.2	-
					7	-	-	-	-	-	-	-
					8	0.1	246	480	6.59	45.3	0.2	-
					9	-	-	-	-	-	-	-
					10	0.3	907	1758	6.80	47.2	0.9	-
					11	-	-	-	-	-	-	-
					12	0.8	4330	8237	6.97	50.2	4.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:55 AM**	13.2	3.4	0.3	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	200	392	6.53	44.7	0.2	-
					5	-	-	-	-	-	-	-
					6	0.1	202	394	6.52	44.8	0.2	-
					7	-	-	-	-	-	-	-
					8	0.2	232	450	6.74	46.4	0.2	-
					9	-	-	-	-	-	-	-
					10	0.3	700	1357	6.86	47.5	0.7	-
					11	-	-	-	-	-	-	-
					12	0.7	3463	6612	7.04	50.3	3.4	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **10:35 AM**	13.6	3.5	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	200	391	6.38	43.7	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	207	403	6.42	44.1	0.2	-
					8	-	-	-	-	-	-	-
					9	0.2	323	629	6.46	44.5	0.3	-
					10	-	-	-	-	-	-	-
					11	0.4	1948	3762	6.59	46.2	1.9	-
					12	-	-	-	-	-	-	-
					13	2.2	10809	19542	6.72	52.7	11.1	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:40 AM**	12.8	2.7	0.4	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.1	683	1334	6.84	47.1	0.6	-
					5	-	-	-	-	-	-	-
					6	0.2	1486	2892	6.84	47.5	1.4	-
					7	-	-	-	-	-	-	-
					8	0.3	2296	4451	6.89	48.3	2.3	-
					9	-	-	-	-	-	-	-
					10	0.7	3271	6246	6.92	49.4	3.3	-
					11	-	-	-	-	-	-	-
					12	1.5	10202	18914	7.69	59.1	10.8	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:55 AM**	12.5	3.1	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	572	1122	6.69	45.9	0.5	-
					5	-	-	-	-	-	-	-
					6	0.1	1421	2776	6.71	46.5	1.4	-
					7	-	-	-	-	-	-	-
					8	0.2	2401	4672	6.76	47.3	2.4	-
					9	-	-	-	-	-	-	-
					10	0.4	3380	6527	6.86	48.6	3.4	-
					11	-	-	-	-	-	-	-
					12	1.7	10876	20018	7.28	56.5	11.5	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **12:15 PM**	12.3	3.0	0.3	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	502	984	6.86	47.1	0.5	0.01
					5	-	-	-	-	-	-	-
					6	0.1	1491	2912	6.74	46.7	1.4	0.01
					7	-	-	-	-	-	-	-
					8	0.1	2445	4776	6.78	47.3	2.4	0.04
					9	-	-	-	-	-	-	-
					10	0.3	3422	6633	6.86	48.5	3.5	0.03
					11	-	-	-	-	-	-	-
					12	0.6	10872	20837	7.14	53.9	11.8	-0.02
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 2/7/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -10°F, 15 mph W wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 6 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 7, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:45 AM

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 398 microsiemens per centimeter (µS/cm) at 1,200 feet upstream to a maximum of 19,591 µS/cm at 1,200 feet downstream.

The DO saturation ranged between 43.2 percent (%) and 49.6%, with an average of 45.7%.

Velocities measured at 1,200 feet upstream of the ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at multiple depths to a maximum of 0.01 ft/s in the downstream direction at multiple depths; average velocity was 0.01 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 3.4 feet to 3.8 feet; average ice thickness was 3.6 feet. Snow depth ranged from 0.2 feet to 0.3 feet; average snow thickness was 0.3 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, February 14, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

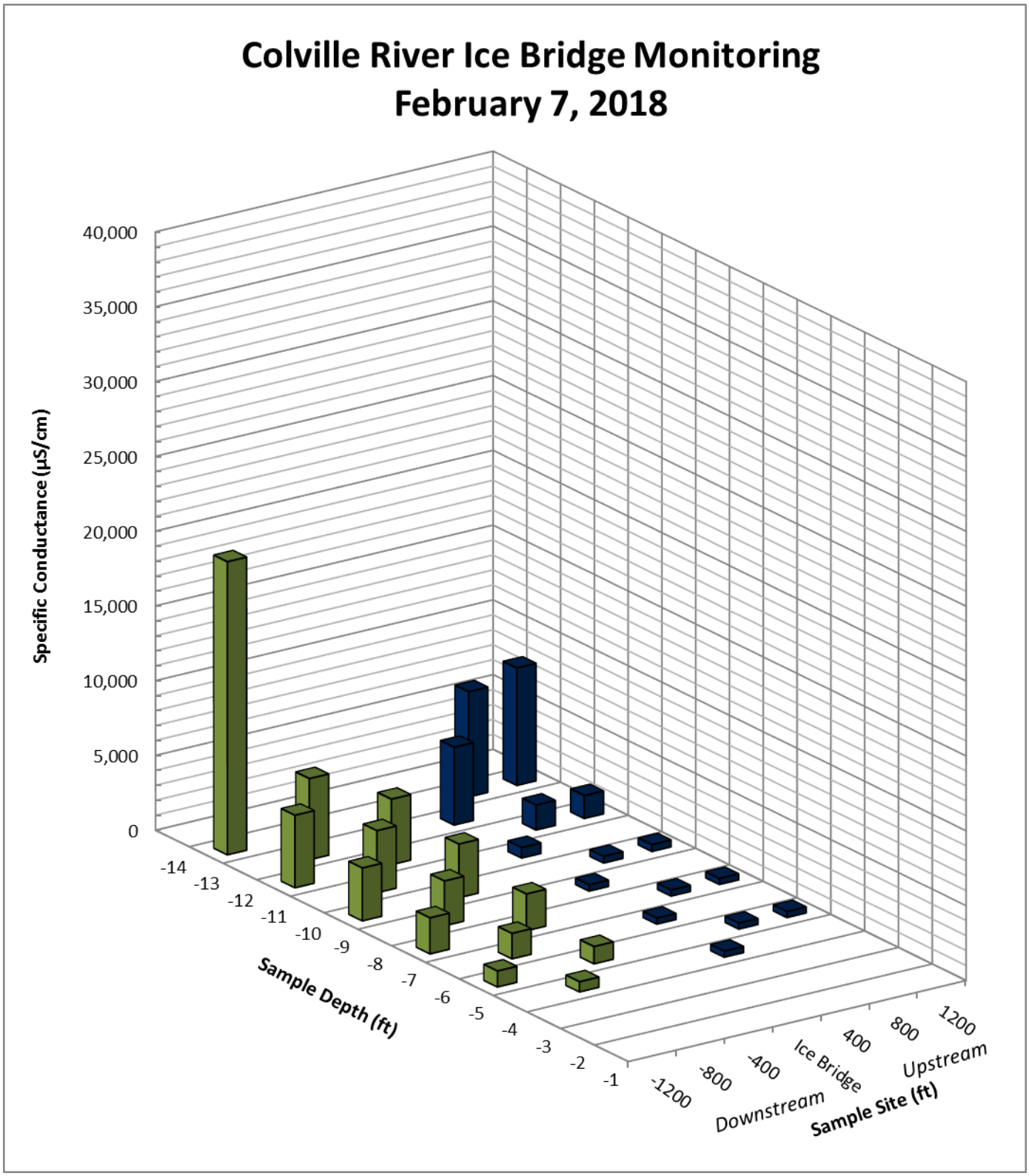
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:19 AM**	13.5	3.4	0.3	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	205	403	6.38	43.7	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	206	403	6.37	43.6	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	213	418	6.37	43.6	0.2	-
					9	-	-	-	-	-	-	-
					10	0.0	361	708	6.54	44.8	0.3	-
					11	-	-	-	-	-	-	-
					12	-0.1	2644	5204	6.79	47.2	2.7	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:00 AM**	14.2	3.4	0.3	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	205	402	6.40	43.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	206	404	6.40	43.8	0.2	-
					8	-	-	-	-	-	-	-
					9	0.0	228	447	6.42	44.0	0.2	-
					10	-	-	-	-	-	-	-
					11	0.1	855	1670	6.54	45.1	0.8	-
					12	-	-	-	-	-	-	-
					13	0.1	3603	7038	7.05	49.6	3.6	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:45 AM**	14.3	3.7	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	203	398	6.64	45.5	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	205	402	no read	no read	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	233	455	6.43	44.2	0.2	-
					10	-	-	-	-	-	-	-
					11	0.3	789	1529	6.56	45.5	0.7	-
					12	-	-	-	-	-	-	-
					13	1.0	4160	7855	6.74	48.8	4.2	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **10:38 AM**	12.7	3.7	0.3	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	588	1153	6.54	44.9	0.5	-
					6	-	-	-	-	-	-	-
					7	0.1	1259	2459	6.52	45.1	1.2	-
					8	-	-	-	-	-	-	-
					9	0.2	1842	3584	6.63	46.2	1.8	-
					10	-	-	-	-	-	-	-
					11	0.2	2250	4378	6.81	47.6	2.2	-
					12	-	-	-	-	-	-	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:08 AM**	13.3	3.7	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	347	680	7.12	48.8	0.3	-
					5	-	-	-	-	-	-	-
					6	0.1	871	1701	6.67	46.0	0.8	-
					7	-	-	-	-	-	-	-
					8	0.3	1545	2995	6.77	47.2	1.5	-
					9	-	-	-	-	-	-	-
					10	0.4	2149	4150	6.88	48.3	2.1	-
					11	-	-	-	-	-	-	-
					12	0.9	2862	5424	6.89	49.3	2.8	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **11:25 AM**	13.8	3.8	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	544	1067	6.50	44.6	0.5	0.01
					6	-	-	-	-	-	-	-
					7	0.2	1238	2409	6.49	45.0	1.2	0.00
					8	-	-	-	-	-	-	-
					9	0.3	1822	3532	6.53	45.6	1.8	0.00
					10	-	-	-	-	-	-	-
					11	0.5	2521	4850	6.43	45.4	2.5	0.01
					12	-	-	-	-	-	-	-
					13	0.9	10337	19591	5.70	43.2	11.0	0.01
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 2/14/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -18 TO 19°F, 0 to 37 mph ESE wind, snow

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 13 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 14, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 4:20 PM. Sampling was delayed because of Phase 2 weather conditions in the morning.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 460 microsiemens per centimeter (µS/cm) at 400 feet upstream to a maximum of 22,453 µS/cm at 1,200 feet downstream.

The DO saturation ranged between 43.8 percent (%) and 55.4%, with an average of 48.3%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.01 feet per second (ft/s) in the downstream direction at 13 feet of depth to a maximum of 0.25 ft/s in the downstream direction at 7 feet of depth; average velocity was 0.06 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 3.7 feet to 4.0 feet; average ice thickness was 3.9 feet. Snow depth ranged from 0.1 feet to 0.4 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, February 21, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

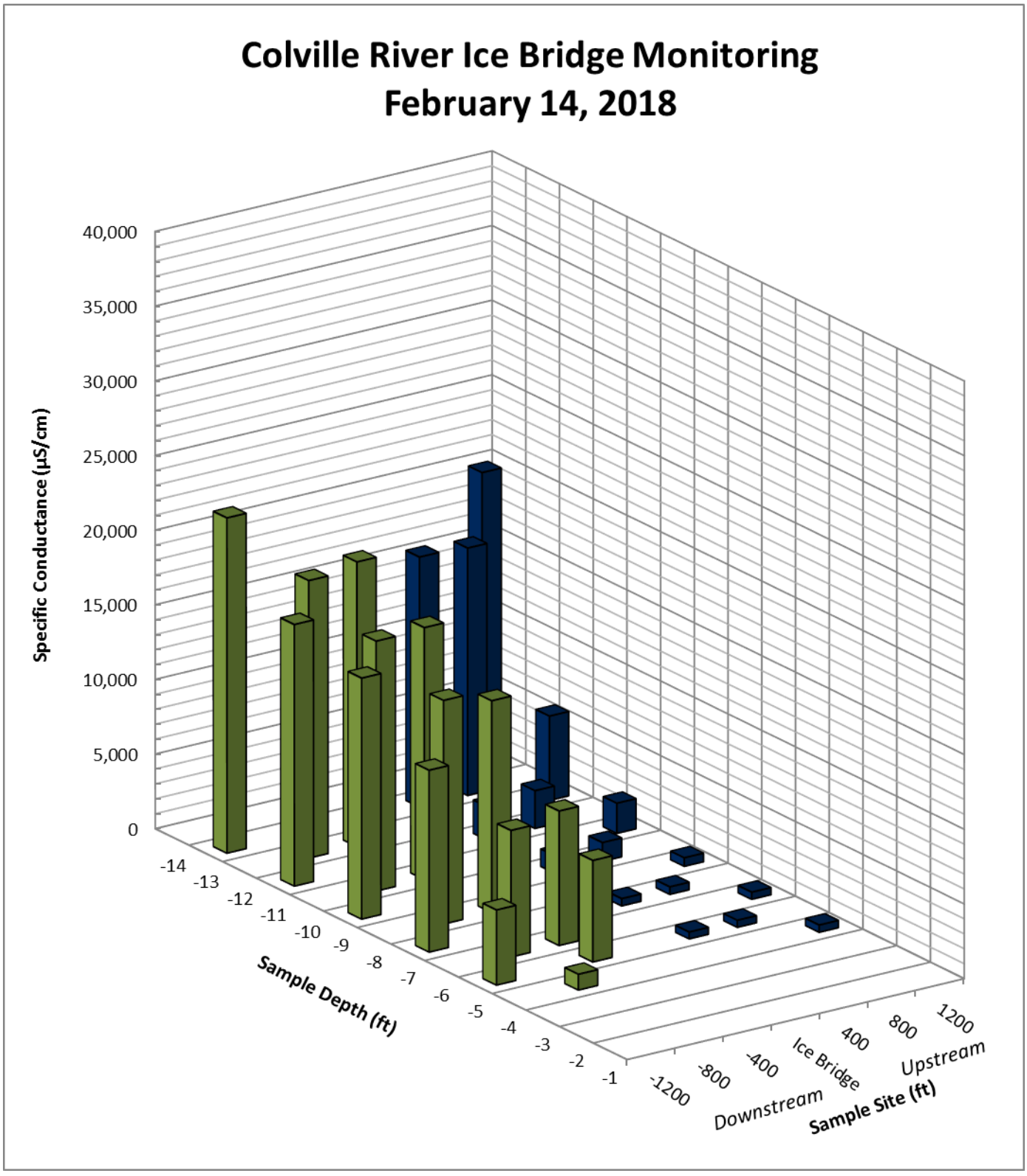
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **4:55 PM**	13.8	3.9	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	235	460	6.50	44.5	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	248	486	6.48	44.4	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	594	1160	6.40	44.1	0.6	-
					10	-	-	-	-	-	-	-
					11	0.2	1149	2236	6.39	44.3	1.1	-
					12	-	-	-	-	-	-	-
					13	0.3	8638	16744	7.05	51.9	9.3	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **4:40 PM**	14.1	3.7	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	241	472	6.53	44.7	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	256	502	6.50	44.5	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	645	1260	6.46	44.5	0.6	-
					10	-	-	-	-	-	-	-
					11	0.3	1304	2528	6.44	44.8	1.3	-
					12	-	-	-	-	-	-	-
					13	0.6	8648	16575	7.39	54.8	9.2	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **4:20 PM**	14.5	3.9	0.1	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	247	485	6.42	44.0	0.2	-
					5	-	-	-	-	-	-	-
					6	0.0	243	477	6.42	44.0	0.2	-
					7	-	-	-	-	-	-	-
					8	0.0	291	570	6.39	43.8	0.3	-
					9	-	-	-	-	-	-	-
					10	0.1	1033	2018	6.41	44.3	1.0	-
					11	-	-	-	-	-	-	-
					12	0.2	2903	5649	6.81	47.8	2.9	-
					13	-	-	-	-	-	-	-
					14	0.4	10232	19759	6.76	50.5	11.1	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **5:15 PM**	13.4	4.0	0.1	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	3467	6798	6.60	46.3	3.5	-
					6	0.1	4608	9001	6.66	47.2	4.8	-
					7	-	-	-	-	-	-	-
					8	0.2	7286	14177	6.86	49.8	7.8	-
					9	-	-	-	-	-	-	-
					10	0.2	8670	16870	7.05	51.8	9.4	-
					11	-	-	-	-	-	-	-
					12	0.4	9872	19064	7.20	53.6	10.6	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **5:30 PM**	13.2	3.7	0.4	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	538	1055	7.28	50.0	0.5	-
					5	-	-	-	-	-	-	-
					6	0.1	4339	8475	6.71	47.5	4.5	-
					7	-	-	-	-	-	-	-
					8	0.2	7695	14973	7.03	51.2	8.2	-
					9	-	-	-	-	-	-	-
					10	0.2	8602	16738	7.17	52.6	9.3	-
					11	-	-	-	-	-	-	-
					12	0.5	9662	18588	7.43	55.4	10.5	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **5:50 PM**	13.9	4.0	0.2	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	2564	5027	6.82	47.5	2.6	0.16
					6	-	-	-	-	-	-	-
					7	0.2	6257	12175	6.87	49.5	6.6	0.25
					8	-	-	-	-	-	-	-
					9	0.2	8292	16135	6.94	50.8	8.9	-0.04
					10	-	-	-	-	-	-	-
					11	0.2	9003	17518	7.06	52.0	9.7	-0.09
					12	-	-	-	-	-	-	-
					13	0.5	11671	22453	7.20	54.6	12.8	0.01
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 2/21/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Ryan Rencehausen	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 20°F, 16 mph WSW wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 20 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 21, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:10 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 613 microsiemens per centimeter (µS/cm) at 1,200 feet upstream to a maximum of 25,427 µS/cm at 800 feet downstream.

The DO saturation ranged between 43.2 percent (%) and 52.7%, with an average of 47.7%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at 6 feet of depth to a maximum of 0.89 ft/s in the downstream direction at 10 feet of depth; average velocity was 0.34 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 3.7 feet to 4.1 feet; average ice thickness was 3.9 feet. Snow depth ranged from 0.0 feet to 0.4 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, February 28, 2017.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

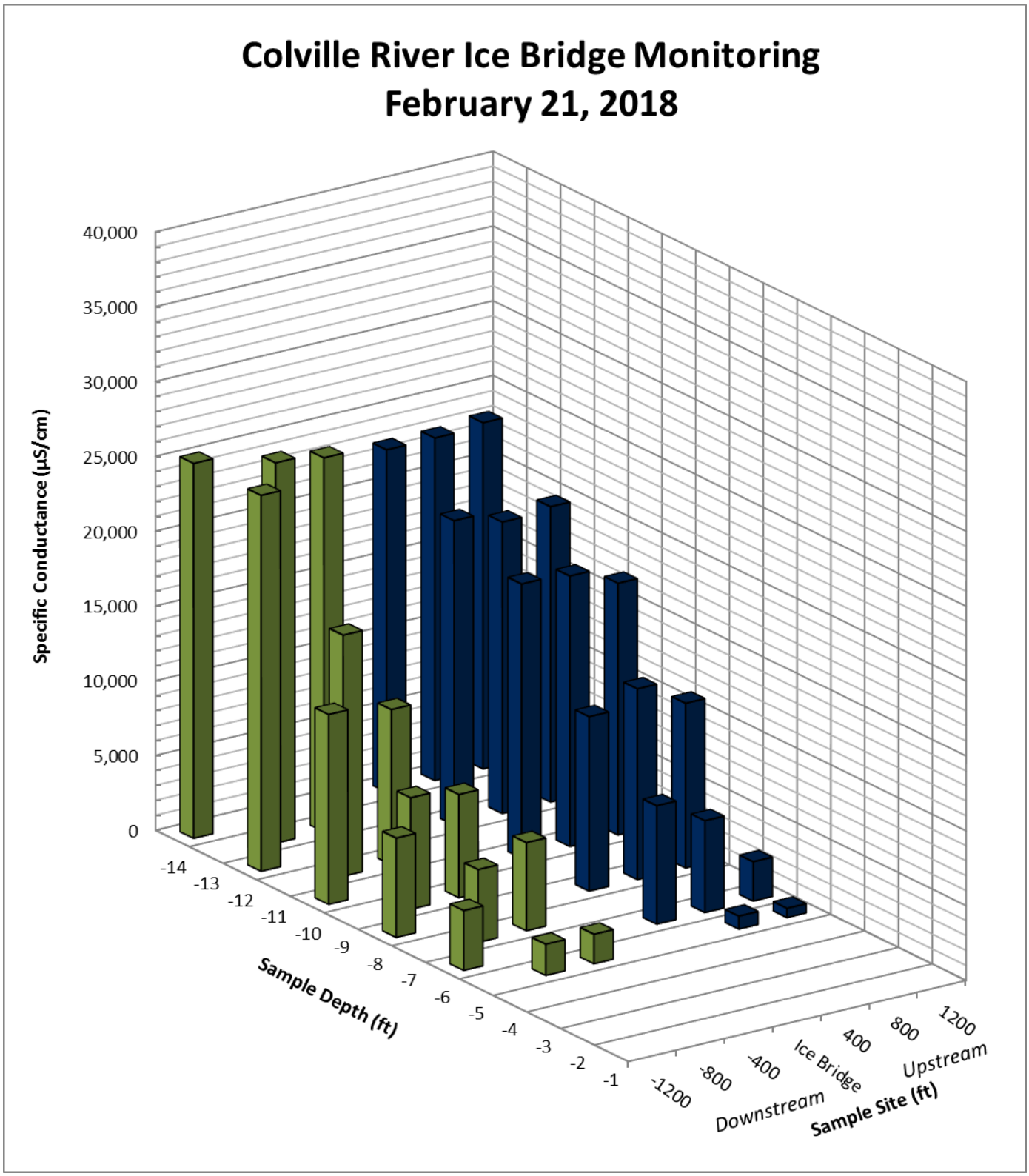
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **9:46 AM**	14.6	4.0	0.1	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.1	4050	7911	6.39	45.1	4.1	-
					7	-	-	-	-	-	-	-
					8	0.2	5991	11657	6.58	47.3	6.4	-
					9	-	-	-	-	-	-	-
					10	0.2	9415	18320	6.59	48.7	10.2	-
					11	-	-	-	-	-	-	-
					12	0.3	10498	20350	6.64	49.6	11.5	-
					13	-	-	-	-	-	-	-
					14	0.3	11808	22889	6.73	50.8	13.0	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **9:27 AM**	14.8	3.9	0.4	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	441	864	6.30	43.2	0.4	-
					6	0.1	3143	6139	6.43	45.1	3.2	-
					7	-	-	-	-	-	-	-
					8	0.2	6550	12745	6.53	47.1	6.8	-
					9	-	-	-	-	-	-	-
					10	0.3	9328	18082	6.54	48.4	10.1	-
					11	-	-	-	-	-	-	-
					12	0.3	10053	19487	6.62	49.3	10.9	-
					13	-	-	-	-	-	-	-
					14	0.3	11814	22901	6.77	51.1	13.0	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:10 AM**	15.0	4.1	0.0	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	313	613	6.33	43.4	0.3	-
					6	0.1	1344	2625	6.56	45.4	1.3	-
					7	-	-	-	-	-	-	-
					8	0.2	5660	11013	6.58	47.2	5.9	-
					9	-	-	-	-	-	-	-
					10	0.3	8680	16826	6.59	48.5	9.3	-
					11	-	-	-	-	-	-	-
					12	0.4	10224	19744	6.70	50.1	11.1	-
					13	-	-	-	-	-	-	-
					14	1.1	12305	23149	6.63	51.3	13.3	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **10:06 AM**	14.3	4.0	0.3	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	1006	1973	6.39	44.0	1.0	-
					6	-	-	-	-	-	-	-
					7	0.1	3014	5887	6.38	44.7	3.0	-
					8	-	-	-	-	-	-	-
					9	0.1	3532	6899	6.43	45.2	3.6	-
					10	-	-	-	-	-	-	-
					11	0.2	5327	10365	6.73	48.1	5.5	-
					12	-	-	-	-	-	-	-
					13	0.4	12940	24988	6.89	52.6	14.3	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **10:23 AM**	14.1	3.7	0.3	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	1062	2082	6.39	44.0	1.0	-
					6	-	-	-	-	-	-	-
					7	0.1	2488	4860	6.30	44.0	2.5	-
					8	-	-	-	-	-	-	-
					9	0.1	3816	7454	6.36	44.8	3.9	-
					10	-	-	-	-	-	-	-
					11	0.2	8280	16111	7.01	51.3	8.9	-
					12	-	-	-	-	-	-	-
					13	0.4	13167	25427	6.88	52.7	14.6	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **10:44 AM**	15.1	3.9	0.2	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.0	2038	3996	6.34	44.0	2.0	0.00
					7	-	-	-	-	-	-	-
					8	0.1	3396	6633	6.33	44.5	3.4	0.28
					9	-	-	-	-	-	-	-
					10	0.1	6495	12687	6.80	49.0	7.1	0.89
					11	-	-	-	-	-	-	-
					12	0.4	13010	25124	6.81	52.1	14.4	0.31
					13	-	-	-	-	-	-	-
					14	0.4	12977	25060	6.87	52.5	14.4	0.23

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 2/28/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -31°F, 9 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 27 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 28, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:30 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 702 microsiemens per centimeter (µS/cm) at 1,200 feet upstream to a maximum of 29,586 µS/cm at 800 feet downstream.

The DO saturation ranged between 40.4 percent (%) and 53.8%, with an average of 47.1%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.01 feet per second (ft/s) in the upstream direction at 10 feet of depth to a maximum of 0.38 ft/s in the downstream direction at 6 feet of depth; average velocity was 0.07 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 3.7 feet to 4.4 feet; average ice thickness was 4.0 feet. Snow depth ranged from 0.1 feet to 0.3 feet; average snow thickness was 0.2 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, March 7, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

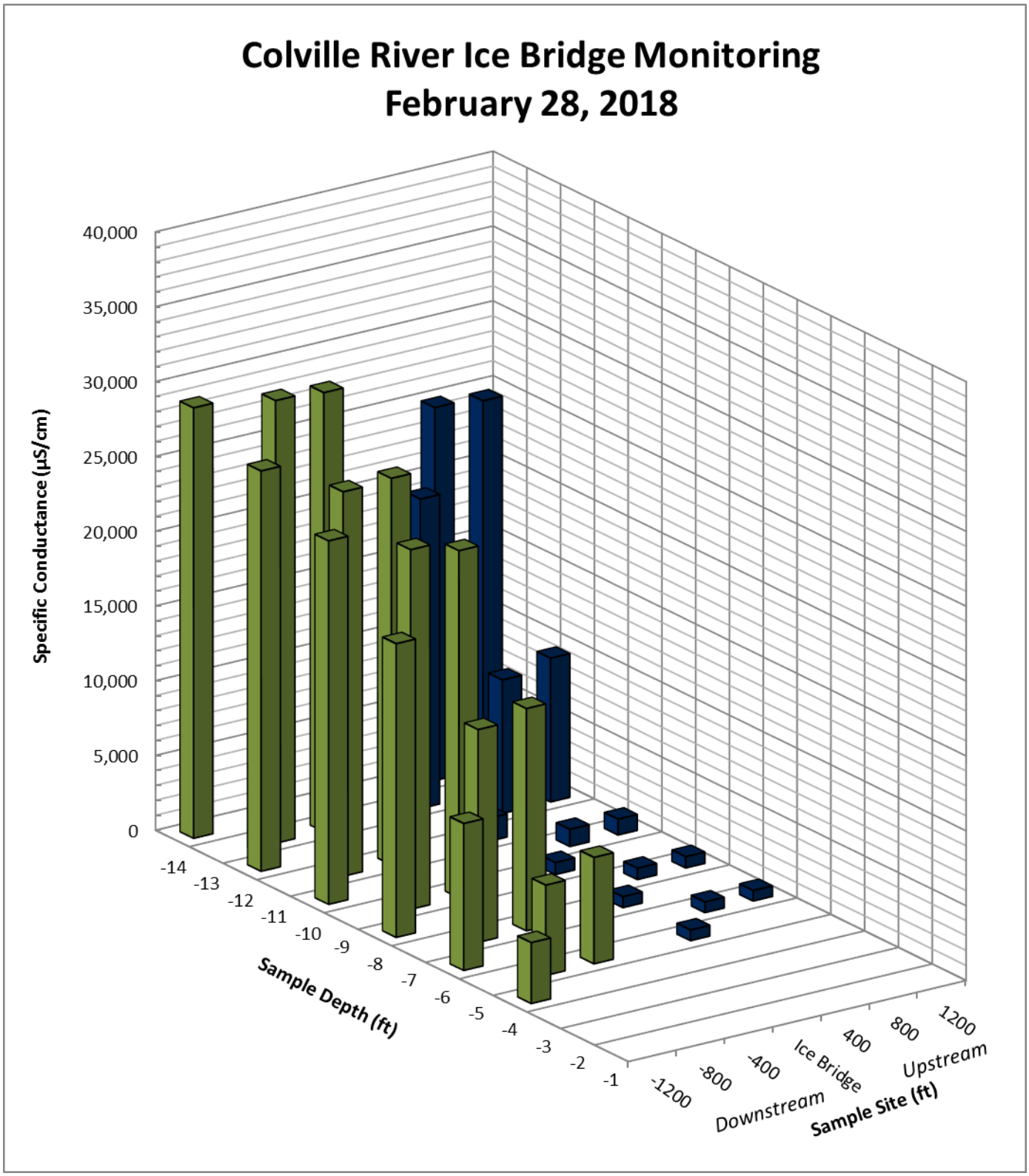
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:20 AM**	14.4	3.7	0.3	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	365	716	6.18	42.4	0.3	-
					6	-	-	-	-	-	-	-
					7	0.0	374	733	6.20	42.5	0.3	-
					8	-	-	-	-	-	-	-
					9	0.0	409	802	6.21	42.6	0.4	-
					10	-	-	-	-	-	-	-
					11	0.1	787	1537	6.27	43.2	0.7	-
					12	-	-	-	-	-	-	-
					13	0.3	10674	20691	7.11	53.2	11.7	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:00 AM**	14.5	4.1	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.0	361	707	6.05	41.5	0.3	-
					7	-	-	-	-	-	-	-
					8	0.0	387	759	6.20	42.5	0.4	-
					9	-	-	-	-	-	-	-
					10	0.1	588	1149	6.36	43.8	0.5	-
					11	-	-	-	-	-	-	-
					12	0.2	4591	8933	6.62	47.2	5.1	-
					13	-	-	-	-	-	-	-
					14	0.7	13059	24935	6.83	52.6	14.3	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:30 AM**	15.0	4.2	0.3	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.0	358	702	5.89	40.4	0.3	-
					7	-	-	-	-	-	-	-
					8	0.0	386	757	6.10	41.8	0.4	-
					9	-	-	-	-	-	-	-
					10	0.1	542	1059	6.23	42.9	0.5	-
					11	-	-	-	-	-	-	-
					12	0.2	4939	9610	6.50	46.3	5.1	-
					13	-	-	-	-	-	-	-
					14	0.5	12797	24619	6.48	49.6	14.1	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **10:40 AM**	13.9	4.4	0.2	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	3640	7110	6.32	44.5	3.7	-
					6	-	-	-	-	-	-	-
					7	0.2	7631	14849	6.54	47.6	8.1	-
					8	-	-	-	-	-	-	-
					9	0.4	12010	23192	6.57	49.8	13.2	-
					10	-	-	-	-	-	-	-
					11	0.4	13372	25823	6.62	50.8	14.8	-
					12	-	-	-	-	-	-	-
					13	0.8	15429	29351	6.54	51.5	17.1	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:00 AM**	14.0	4.0	0.1	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	3075	6029	6.38	44.6	3.1	-
					6	-	-	-	-	-	-	-
					7	0.2	7306	14216	6.51	47.3	7.8	-
					8	-	-	-	-	-	-	-
					9	0.4	12444	24031	6.57	50.0	13.7	-
					10	-	-	-	-	-	-	-
					11	0.5	13355	25693	6.58	50.6	14.8	-
					12	-	-	-	-	-	-	-
					13	0.7	15495	29586	6.52	51.3	17.3	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **11:30 AM**	14.5	3.8	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	2074	4067	6.77	47.0	2.1	0.01
					5	-	-	-	-	-	-	-
					6	0.1	5026	9817	6.52	46.4	5.2	0.38
					7	-	-	-	-	-	-	-
					8	0.3	10124	19625	6.71	50.0	11.0	0.05
					9	-	-	-	-	-	-	-
					10	0.4	12578	24289	6.69	51.0	13.9	-0.01
					11	-	-	-	-	-	-	-
					12	0.6	13961	26758	6.73	52.1	15.5	-0.02
					13	-	-	-	-	-	-	-
					14	1.3	15407	28772	6.76	53.8	16.7	0.02

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 3/7/2018
MICHAEL BAKER FIELD PERSONNEL: Garrett Yager	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 6°F, 5 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, March 6 at 7:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on March 7, Mr. Yager attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:00 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 451 microsiemens per centimeter (µS/cm) at 1,200 feet upstream to a maximum of 27,754 µS/cm at 800 feet downstream.

The DO saturation ranged between 38.0 percent (%) and 53.8%, with an average of 44.7%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at 5 feet of depth to a maximum of 0.13 ft/s in the downstream direction at 11 feet of depth; average velocity was 0.05 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 3.7 feet to 4.5 feet; average ice thickness was 4.2 feet. Snow depth ranged from 0.2 feet to 0.6 feet; average snow thickness was 0.3 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, March 14, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **9:35 AM**	13.9	4.3	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	233	456	5.61	38.4	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	244	476	5.65	38.8	0.2	-
					8	-	-	-	-	-	-	-
					9	0.2	316	615	5.95	41.0	0.3	-
					10	-	-	-	-	-	-	-
					11	0.3	8260	16011	6.69	49.1	8.8	-
					12	-	-	-	-	-	-	-
					13	0.7	13658	26079	6.91	53.5	15.0	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **9:20 AM**	14.2	3.7	0.6	0.1	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	231	452	5.55	38.0	0.2	-
					6	-	-	-	-	-	-	-
					7	0.0	238	467	5.62	38.5	0.2	-
					8	-	-	-	-	-	-	-
					9	0.1	310	606	6.01	41.3	0.3	-
					10	-	-	-	-	-	-	-
					11	0.4	8973	17328	6.64	49.1	9.6	-
					12	-	-	-	-	-	-	-
					13	0.8	13616	25902	6.61	51.3	14.9	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:00 AM**	14.4	4.2	0.3	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	230	451	5.56	38.1	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	238	465	5.59	38.4	0.2	-
					8	-	-	-	-	-	-	-
					9	0.2	380	739	5.76	39.7	0.4	-
					10	-	-	-	-	-	-	-
					11	0.5	8320	16006	6.42	47.4	8.9	-
					12	-	-	-	-	-	-	-
					13	1.3	13360	24950	6.63	52.0	14.5	-
					14	-	-	-	-	-	-	-

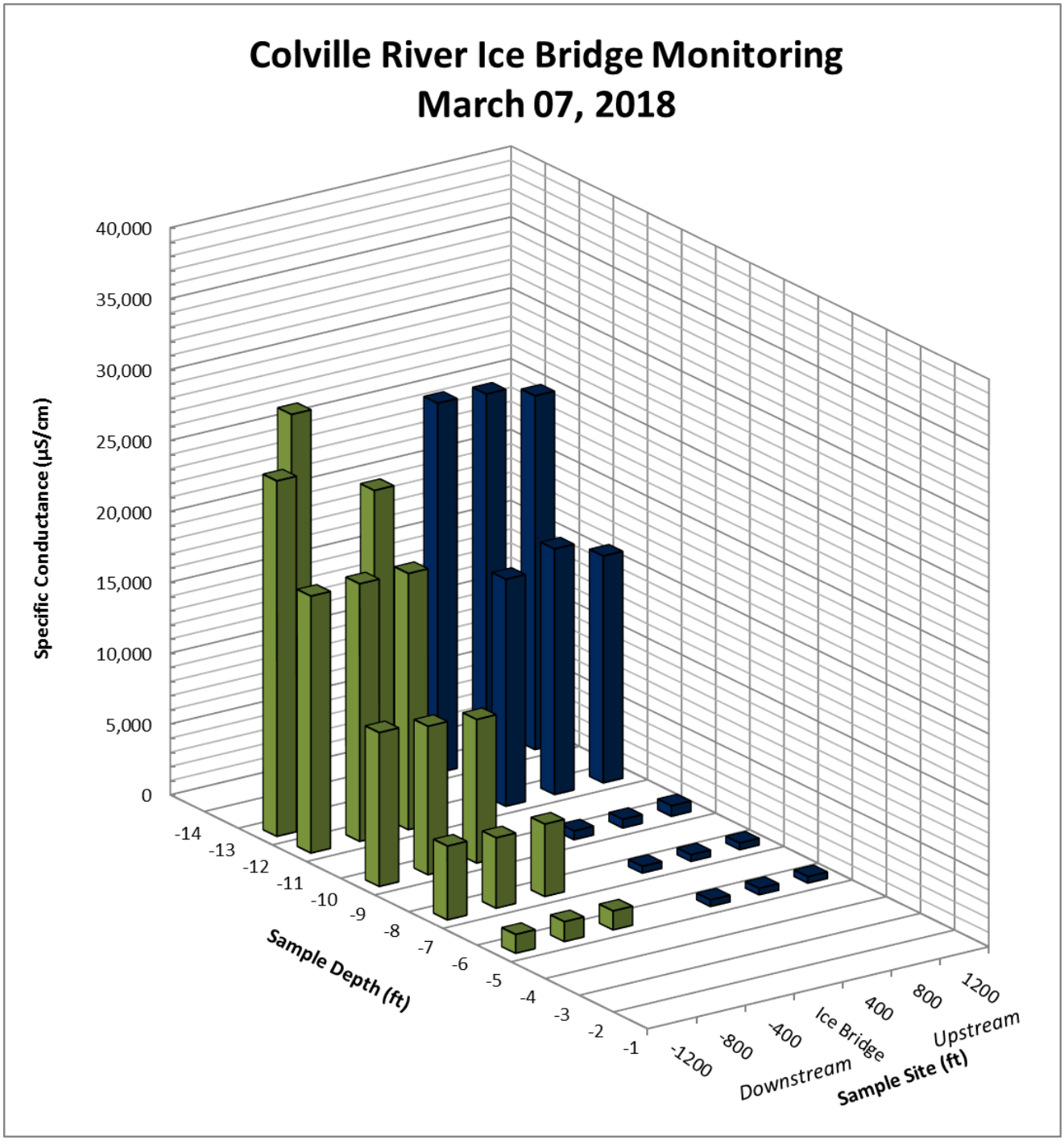
Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **9:50 AM**	13.5	4.5	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	680	1333	5.91	40.6	0.6	-
					6	-	-	-	-	-	-	-
					7	0.2	2622	5102	5.95	41.7	2.6	-
					8	-	-	-	-	-	-	-
					9	0.2	5203	10124	6.20	44.3	5.4	-
					10	-	-	-	-	-	-	-
					11	0.3	9320	18066	6.54	48.4	10.1	-
					12	0.7	11913	22747	6.63	50.6	13.0	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **10:10 AM**	13.6	4.4	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	715	1402	5.88	40.4	0.7	-
					6	-	-	-	-	-	-	-
					7	0.2	2550	4962	6.00	42.0	2.5	-
					8	-	-	-	-	-	-	-
					9	0.3	5400	10468	6.38	45.8	5.6	-
					10	-	-	-	-	-	-	-
					11	0.4	9405	18162	6.59	48.9	10.1	-
					12	-	-	-	-	-	-	-
					13	0.9	14644	27754	6.50	51.0	16.1	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **10:25 AM**	13.5	4.2	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	680	1328	5.89	40.6	0.6	0.00
					6	-	-	-	-	-	-	-
					7	0.2	2673	5201	6.17	43.2	2.7	0.02
					8	-	-	-	-	-	-	-
					9	0.3	5595	10846	6.42	46.1	5.8	0.03
					10	-	-	-	-	-	-	-
					11	0.4	9380	18114	6.74	50.0	10.1	0.13
					12	0.5	13028	25063	7.01	53.8	14.4	0.05
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.

Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge



PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 3/14/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Ryan Renchausen	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -3°F, 15 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, March 13 at 6:30 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on March 14, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 10:15 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the ice bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 424 microsiemens per centimeter (µS/cm) at 800 feet upstream to a maximum of 25,332 µS/cm also at 800 feet upstream.

The DO saturation ranged between 37.7 percent (%) and 58.7%, with an average of 46.2%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at 4 feet of depth to a maximum of 0.06 ft/s in the downstream direction at 10 feet of depth; average velocity was 0.02 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 3.9 feet to 4.4 feet; average ice thickness was 4.1 feet. Snow depth ranged from 0.2 feet to 0.4 feet; average snow thickness was 0.3 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, March 21, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **11:10 AM**	13.5	4.0	0.3	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	219	429	5.59	38.3	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	219	428	5.68	39.0	0.2	-
					8	-	-	-	-	-	-	-
					9	0.2	296	575	6.04	41.6	0.3	-
					10	-	-	-	-	-	-	-
					11	0.4	2940	5677	7.73	54.6	3.0	-
					12	-	-	-	-	-	-	-
					13	0.7	13251	25302	7.22	55.7	14.5	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:45 AM**	13.5	4.0	0.4	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	218	427	5.58	38.2	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	217	424	5.62	38.6	0.2	-
					8	-	-	-	-	-	-	-
					9	0.2	249	484	5.88	40.5	0.2	-
					10	-	-	-	-	-	-	-
					11	0.5	1944	3740	7.34	51.6	1.9	-
					12	-	-	-	-	-	-	-
					13	1.0	13416	25332	7.03	54.7	14.6	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **10:15 AM**	14.1	4.0	0.4	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	217	426	5.50	37.7	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	219	427	5.63	38.7	0.2	-
					8	-	-	-	-	-	-	-
					9	0.2	254	494	5.88	40.5	0.2	-
					10	-	-	-	-	-	-	-
					11	0.5	2208	4248	7.16	50.4	2.2	-
					12	-	-	-	-	-	-	-
					13	1.6	13373	24703	6.48	51.2	14.4	-
					14	-	-	-	-	-	-	-

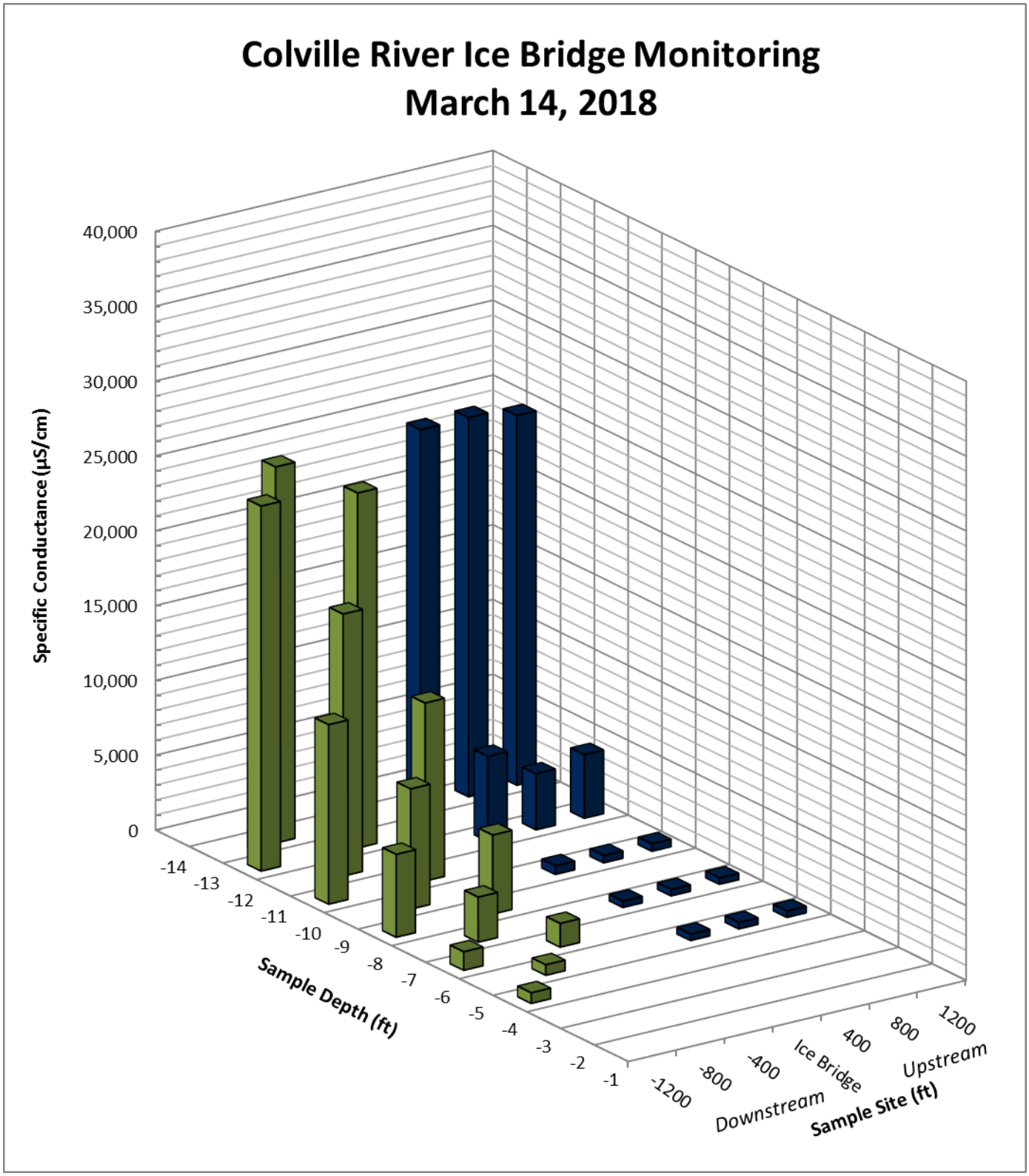
Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:30 AM**	12.5	4.4	0.3	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.2	813	1582	5.89	40.7	0.8	-
					7	-	-	-	-	-	-	-
					8	0.4	2733	5278	6.23	43.9	2.7	-
					9	-	-	-	-	-	-	-
					10	0.9	6274	11891	7.32	53.7	6.5	-
					11	-	-	-	-	-	-	-
					12	1.5	12791	23713	7.49	58.7	13.6	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:50 AM**	13.5	4.2	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	358	699	5.79	39.8	0.3	-
					6	-	-	-	-	-	-	-
					7	0.2	1546	3008	6.01	41.8	1.5	-
					8	-	-	-	-	-	-	-
					9	0.4	4158	8030	6.67	47.5	4.2	-
					10	-	-	-	-	-	-	-
					11	0.7	9166	17502	7.51	56.1	9.8	-
					12	-	-	-	-	-	-	-
					13	0.9	13257	25125	7.31	56.7	14.4	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **12:10 PM**	12.5	3.9	0.4	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.0	361	707	5.79	39.7	0.3	0.00
					5	-	-	-	-	-	-	-
					6	0.1	633	1236	5.79	39.9	0.6	-0.01
					7	-	-	-	-	-	-	-
					8	0.3	2854	5532	6.25	44.0	2.9	0.02
					9	-	-	-	-	-	-	-
					10	0.4	6207	11986	7.07	51.2	6.5	0.06
					11	-	-	-	-	-	-	-
					12	0.6	12721	24381	7.32	56.1	13.9	0.02
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.

Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge



PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 3/21/2018
MICHAEL BAKER FIELD PERSONNEL: Jen Gillenwater	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Ryan Renchausen	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -8°F, <15 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, March 20 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on March 21, Ms. Gillenwater attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:25 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the Colville River Ice Bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the Colville River Ice Bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 475 microsiemens per centimeter (µS/cm) at 800 feet upstream to a maximum of 25,335 µS/cm at 1,200 feet upstream.

The DO saturation ranged between 37.1 percent (%) and 63.2%, with an average of 46.9%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at 8 and 6 feet of depth to a maximum of 0.01 ft/s in the downstream direction at 12 feet of depth; average velocity was 0.00 ft/s. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 4.0 feet to 4.5 feet; average ice thickness was 4.3 feet. Snow depth ranged from 0.2 feet to 0.6 feet; average snow thickness was 0.4 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, March 28, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:02 AM**	13.6	4.2	0.4	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	245	481	5.42	37.1	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	271	530	5.46	37.5	0.3	-
					8	-	-	-	-	-	-	-
					9	0.4	658	1271	5.75	39.9	0.6	-
					10	-	-	-	-	-	-	-
					11	0.5	6046	11631	7.26	52.6	6.3	-
					12	-	-	-	-	-	-	-
					13	1.1	13421	25248	7.28	56.8	14.6	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **9:43 AM**	14.0	4.2	0.6	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	242	475	5.52	37.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.1	244	477	5.59	38.4	0.2	-
					8	-	-	-	-	-	-	-
					9	0.3	320	621	6.03	41.7	0.3	-
					10	-	-	-	-	-	-	-
					11	0.4	6426	12409	7.93	57.5	6.7	-
					12	-	-	-	-	-	-	-
					13	0.6	13134	25172	8.22	63.2	14.4	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:25 AM**	14.0	4.5	0.4	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.0	243	476	5.47	37.5	0.2	-
					6	-	-	-	-	-	-	-
					7	0.2	251	488	5.56	38.3	0.2	-
					8	-	-	-	-	-	-	-
					9	0.4	651	1257	6.09	42.3	0.6	-
					10	-	-	-	-	-	-	-
					11	0.7	6726	12843	7.41	54.3	7.0	-
					12	-	-	-	-	-	-	-
					13	1.1	13467	25335	7.01	54.7	14.6	-
					14	-	-	-	-	-	-	-

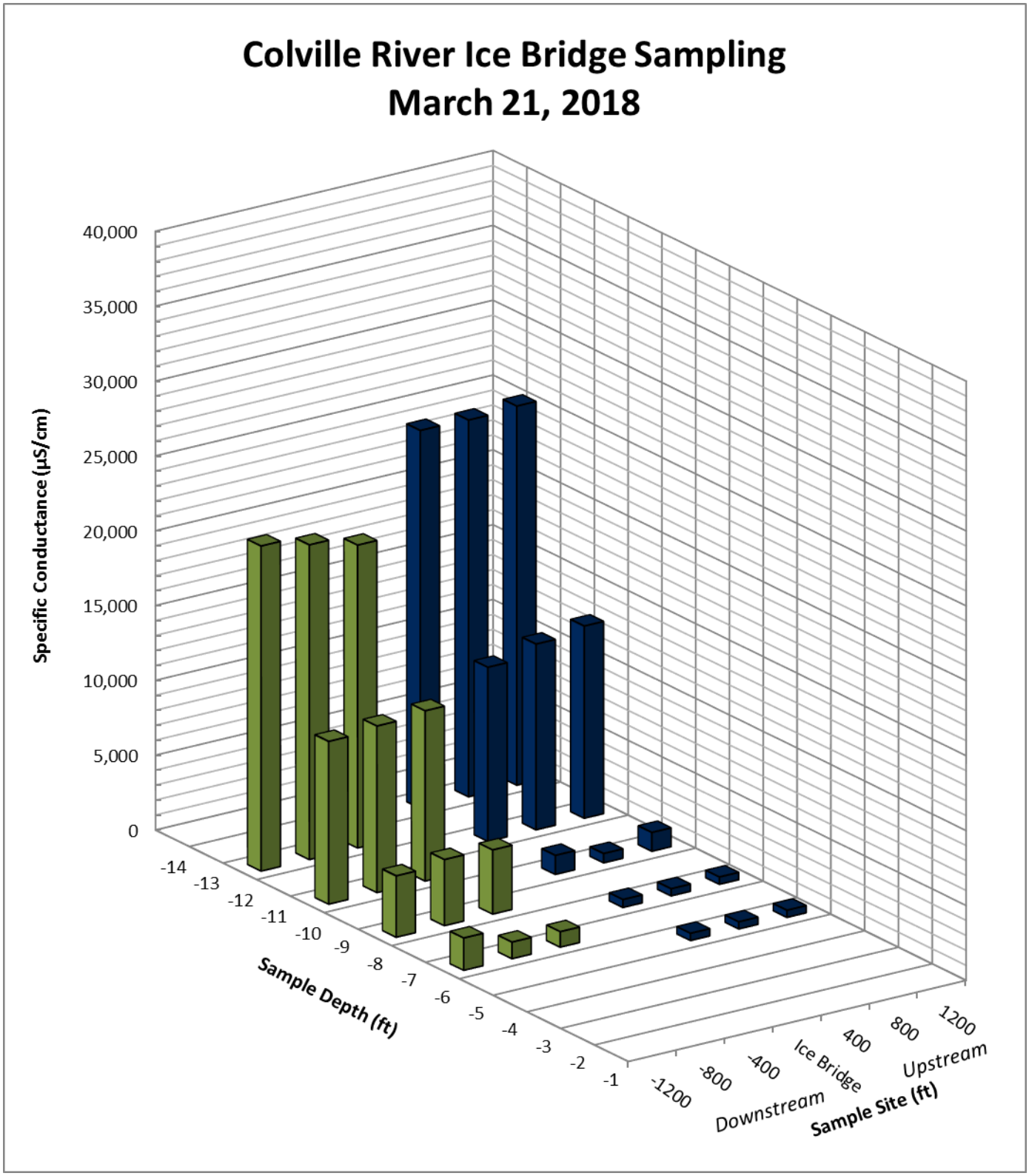
Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **10:35 AM**	12.5	4.5	0.5	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.1	528	1031	5.61	38.6	0.5	-
					7	-	-	-	-	-	-	-
					8	0.4	2219	4285	6.24	43.8	2.2	-
					9	-	-	-	-	-	-	-
					10	0.6	5933	11371	7.25	52.6	6.2	-
					11	-	-	-	-	-	-	-
					12	1.1	10755	20233	7.87	60.1	11.5	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **10:54 AM**	13.1	4.4	0.4	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.1	568	1109	5.61	38.6	0.5	-
					7	-	-	-	-	-	-	-
					8	0.3	2277	4414	6.05	42.4	2.2	-
					9	-	-	-	-	-	-	-
					10	0.4	5762	11127	6.92	49.9	6.0	-
					11	-	-	-	-	-	-	-
					12	0.8	11050	21020	7.58	57.6	11.9	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **11:11 AM**	12.9	4.0	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.3	1112	2156	5.81	40.4	1.1	0.00
					7	-	-	-	-	-	-	-
					8	0.4	2122	4098	6.17	43.3	2.1	0.00
					9	-	-	-	-	-	-	-
					10	0.6	5672	10871	7.03	50.9	5.9	-0.01
					11	-	-	-	-	-	-	-
					12	1.0	11501	21716	7.65	58.6	12.3	0.01
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.

Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge



PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 3/28/2018
MICHAEL BAKER FIELD PERSONNEL: Garrett Yager	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Jaron Varga	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** -18°F, 9 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, March 27 at 5:30 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on March 28, Mr. Yager attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:15 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the Colville River ice bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the Colville River Ice Bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 461 microsiemens per centimeter (µS/cm) at 1,200 feet upstream to a maximum of 25,536 µS/cm at 1,200 feet upstream.

The DO saturation ranged between 36.0 percent (%) and 77.6%, with an average of 53.3%.

Velocities measured at 1,200 feet downstream of the Colville River ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at 7 and 5 feet of depth to a maximum of 0.06 ft/s in the downstream direction at 11 feet of depth; average velocity was 0.02 ft/s. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 4.3 feet to 4.8 feet; average ice thickness was 4.5 feet. Snow depth ranged from 0.1 feet to 0.6 feet; average snow depth was 0.3 feet.

Water quality parameters upstream and downstream of the Colville River ice bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, April 4, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **9:50 AM**	13.5	4.5	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.2	238	464	5.33	36.7	0.2	-
					6	-	-	-	-	-	-	-
					7	0.3	266	515	5.51	38.1	0.2	-
					8	-	-	-	-	-	-	-
					9	0.6	890	1706	6.57	46.0	0.8	-
					10	-	-	-	-	-	-	-
					11	1.1	8743	16448	9.19	69.1	9.2	-
					12	1.2	12872	24127	8.54	66.5	13.9	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **9:35 AM**	13.8	4.3	0.6	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	238	464	5.43	37.3	0.2	-
					6	-	-	-	-	-	-	-
					7	0.3	240	465	5.62	38.8	0.2	-
					8	-	-	-	-	-	-	-
					9	0.6	415	795	6.62	46.2	0.4	-
					10	-	-	-	-	-	-	-
					11	1.3	8807	16447	9.53	72.0	9.2	-
					12	-	-	-	-	-	-	-
					13	2.3	13953	25137	9.04	72.8	14.5	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:15 AM**	14.0	4.4	0.3	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.2	237	461	5.23	36.0	0.2	-
					6	-	-	-	-	-	-	-
					7	0.4	250	482	5.38	37.3	0.2	-
					8	-	-	-	-	-	-	-
					9	0.6	560	1073	6.39	44.6	0.5	-
					10	-	-	-	-	-	-	-
					11	1.2	8650	16213	9.18	69.1	9.1	-
					12	-	-	-	-	-	-	-
					13	1.5	13774	25536	8.52	67.3	14.8	-
					14	-	-	-	-	-	-	-

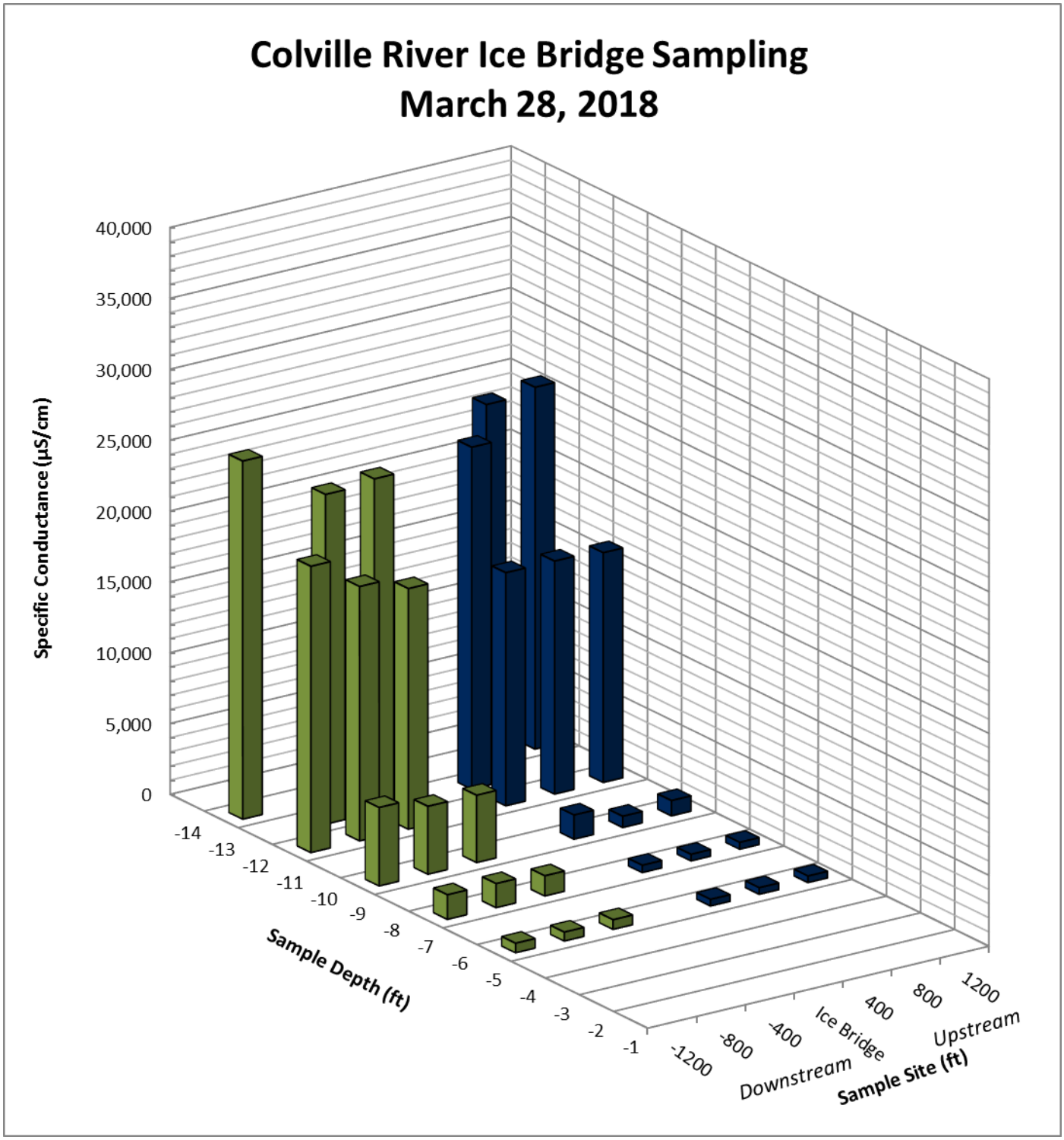
Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI ProPlus meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **10:15 AM**	13.1	4.8	0.1	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.2	349	679	5.77	39.8	0.3	-
					6	-	-	-	-	-	-	-
					7	0.5	738	1420	6.10	42.5	0.7	-
					8	-	-	-	-	-	-	-
					9	0.9	2506	4749	6.98	49.8	2.5	-
					10	-	-	-	-	-	-	-
					11	1.1	9022	16973	8.48	63.9	9.5	-
					12	1.4	12650	23538	8.15	63.6	13.5	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **10:30 AM**	13.0	4.7	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.2	325	631	5.70	39.3	0.3	-
					6	-	-	-	-	-	-	-
					7	0.5	881	1695	6.23	43.5	0.8	-
					8	-	-	-	-	-	-	-
					9	0.9	2528	4791	6.98	49.8	2.5	-
					10	-	-	-	-	-	-	-
					11	1.2	9573	17943	9.01	68.3	10.0	-
					12	1.7	12640	23264	9.34	73.4	13.3	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **10:50 AM**	13.8	4.5	0.6	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.4	347	670	5.83	40.4	0.3	0.00
					6	-	-	-	-	-	-	-
					7	0.6	904	1733	6.39	44.7	0.9	0.00
					8	-	-	-	-	-	-	-
					9	1.1	2940	5531	7.31	52.6	2.9	0.02
					10	-	-	-	-	-	-	-
					11	1.6	10933	20195	9.30	72.0	11.5	0.06
					12	-	-	-	-	-	-	-
					13	2.4	14074	25266	9.60	77.6	14.7	0.01
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI ProPlus meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C.
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.

Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge



PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 4/4/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Jim Estes	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 0°F, 15 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, April 3 at 5:30 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on April 4, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 10:35 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the Colville River Ice Bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the Colville River Ice Bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 499 microsiemens per centimeter (µS/cm) at 800 feet upstream to a maximum of 23,458 µS/cm at 1,200 feet downstream.

The DO saturation ranged between 38.4 percent (%) and 82.7%, with an average of 55.0%.

Velocities measured at 1,200 feet downstream of the Colville River Ice Bridge ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at 9 and 11 feet of depth to a maximum of 0.03 ft/s in the downstream direction at 5 feet of depth; average velocity was 0.01 ft/s. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 4.4 feet to 4.7 feet; average ice thickness was 4.6 feet. Snow depth ranged from 0.2 feet to 0.4 feet; average snow depth was 0.3 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next sampling event is scheduled for Wednesday, April 11, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **11:33 AM**	13.6	4.4	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	260	508	5.82	40.0	0.2	-
					6	-	-	-	-	-	-	-
					7	0.3	290	563	6.08	42.0	0.3	-
					8	-	-	-	-	-	-	-
					9	0.7	1172	2238	7.14	50.2	1.1	-
					10	-	-	-	-	-	-	-
					11	1.1	7812	14696	8.22	61.3	8.1	-
					12	-	-	-	-	-	-	-
					13	2.3	12785	23033	8.97	71.6	13.3	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:57 AM**	13.8	4.7	0.2	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	256	499	5.65	38.8	0.2	-
					6	-	-	-	-	-	-	-
					7	0.3	293	569	6.02	41.6	0.3	-
					8	-	-	-	-	-	-	-
					9	0.7	1139	2175	6.61	46.4	1.0	-
					10	-	-	-	-	-	-	-
					11	1.0	7402	13977	7.85	58.2	7.6	-
					12	-	-	-	-	-	-	-
					13	3.2	13185	23022	6.93	56.7	13.5	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **10:35 AM**	14.2	4.6	0.3	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	256	501	5.59	38.4	0.2	-
					6	-	-	-	-	-	-	-
					7	0.2	290	564	5.85	40.3	0.3	-
					8	-	-	-	-	-	-	-
					9	0.7	949	1812	6.80	47.7	0.9	-
					10	-	-	-	-	-	-	-
					11	0.9	7267	13773	7.93	58.6	7.6	-
					12	-	-	-	-	-	-	-
					13	1.4	12551	23353	7.69	60.0	13.4	-
					14	-	-	-	-	-	-	-

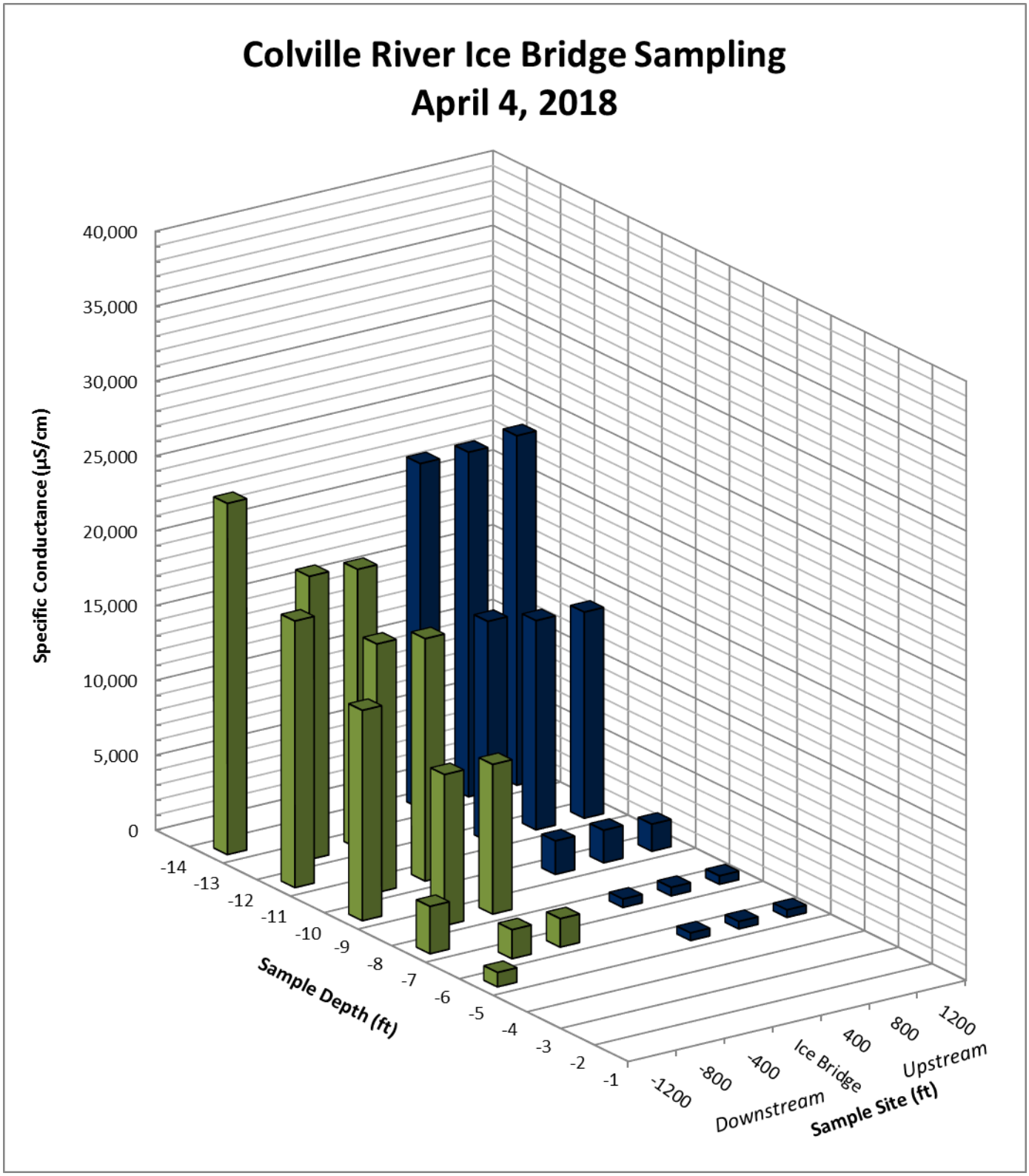
Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **12:00 PM**	12.7	4.7	0.3	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.4	984	1900	6.46	45.0	0.9	-
					7	-	-	-	-	-	-	-
					8	0.8	5255	9997	8.45	61.3	5.3	-
					9	-	-	-	-	-	-	-
					10	1.4	8700	16188	8.35	63.2	9.0	-
					11	-	-	-	-	-	-	-
					12	2.7	10477	18612	9.77	77.4	10.6	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **12:38 PM**	13.0	4.5	0.4	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.5	1007	1937	6.87	48.0	0.9	-
					7	-	-	-	-	-	-	-
					8	0.9	5324	10090	8.25	60.1	5.4	-
					9	-	-	-	-	-	-	-
					10	1.3	8890	16602	8.04	60.8	9.2	-
					11	-	-	-	-	-	-	-
					12	2.6	10611	18916	9.99	79.0	10.8	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **1:09 PM**	13.6	4.5	0.4	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	492	961	6.25	43.0	0.5	0.03
					6	-	-	-	-	-	-	-
					7	0.6	1649	3160	7.48	52.6	1.6	0.02
					8	-	-	-	-	-	-	-
					9	0.9	7412	14047	7.95	58.8	7.7	0.00
					10	-	-	-	-	-	-	-
					11	1.6	9641	17809	7.47	57.2	10.0	0.00
					12	-	-	-	-	-	-	-
					13	3.1	13389	23458	10.12	82.7	13.6	0.02
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.

Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge



PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 4/11/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Mike Rourke	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 0°F, 10 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, April 10 at 6:20 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on April 11, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 10:10 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the Colville River Ice Bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the Colville River Ice Bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 504 microsiemens per centimeter (µS/cm) at 400 feet upstream to a maximum of 24,008 µS/cm also at 400 feet upstream.

The DO saturation ranged between 36.4 percent (%) and 111.2%, with an average of 61.2%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.00 feet per second (ft/s) at multiple depths to a maximum of 0.01 ft/s in the upstream direction at multiple depths; average velocity was 0.00 ft/s. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 4.9 feet and 5.0 feet; average ice thickness was 5.0 feet. Snow depth ranged from 0.0 feet to 0.5 feet; average snow thickness was 0.1 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. The next and final sampling event of the season is scheduled for Wednesday, April 18, 2018.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

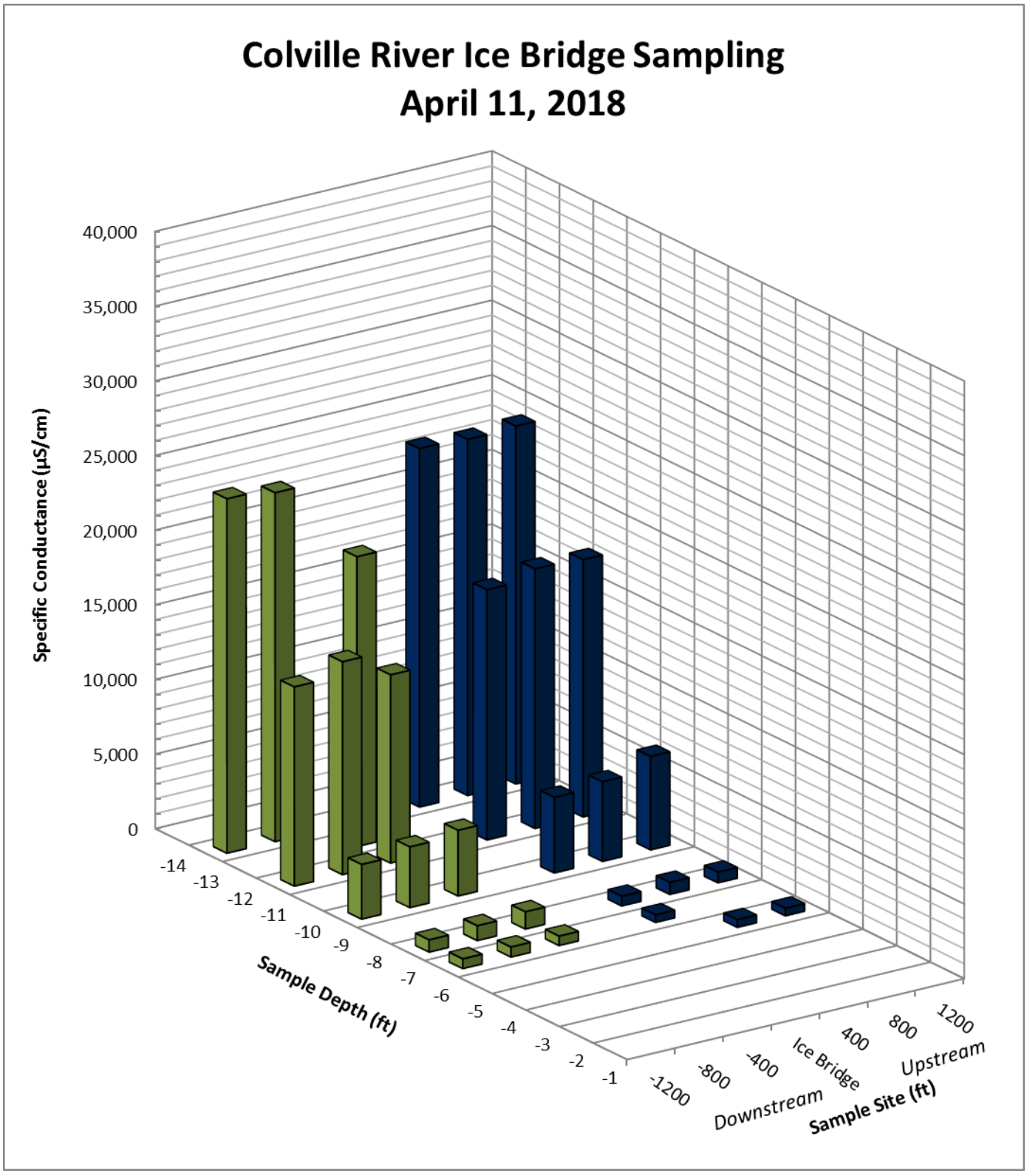
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:50 AM**	13.5	5.0	0.1	no data	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.3	260	504	5.59	38.6	0.2	-
					7	0.4	333	644	6.16	42.7	0.3	-
					8	-	-	-	-	-	-	-
					9	0.7	2657	5073	8.81	62.6	2.7	-
					10	-	-	-	-	-	-	-
					11	1.5	9043	16765	9.83	74.8	9.4	-
					12	-	-	-	-	-	-	-
					13	1.5	12950	24008	11.05	86.7	13.8	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:30 AM**	14.0	4.9	0.5	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.2	262	510	5.53	38.1	0.2	-
					6	-	-	-	-	-	-	-
					7	0.4	416	803	6.08	42.2	0.4	-
					8	-	-	-	-	-	-	-
					9	0.8	2803	5332	8.87	63.2	2.7	-
					10	-	-	-	-	-	-	-
					11	1.5	9377	17384	9.31	71.0	9.7	-
					12	-	-	-	-	-	-	-
					13	1.8	13010	23859	9.67	76.4	13.7	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **10:10 AM**	13.8	4.9	0.2	0.2	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.2	260	506	5.28	36.4	0.2	-
					6	-	-	-	-	-	-	-
					7	0.6	373	715	5.45	38.0	0.3	-
					8	-	-	-	-	-	-	-
					9	1.1	3324	6253	9.02	65.1	3.4	-
					10	-	-	-	-	-	-	-
					11	1.7	9364	17235	8.90	68.2	9.7	-
					12	-	-	-	-	-	-	-
					13	2.2	13262	23977	9.83	78.6	13.9	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:20 AM**	13.4	5.0	0.1	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.3	324	627	5.61	38.8	0.3	-
					7	0.5	599	1152	6.10	42.5	0.6	-
					8	-	-	-	-	-	-	-
					9	1.0	2331	4401	7.89	56.4	2.3	-
					10	-	-	-	-	-	-	-
					11	1.8	6874	12606	10.64	80.1	6.7	-
					12	3.4	11195	19414	10.70	86.6	11.1	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:40 AM**	13.5	5.0	0.0	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.4	347	670	5.73	39.7	0.3	-
					7	0.5	516	993	6.34	44.1	0.5	-
					8	-	-	-	-	-	-	-
					9	0.9	2144	4063	7.83	55.7	2.1	-
					10	-	-	-	-	-	-	-
					11	1.7	7746	14257	10.19	77.2	8.0	-
					12	-	-	-	-	-	-	-
					13	2.8	13200	23368	13.73	111.2	13.5	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **12:00 PM**	13.7	5.0	0.0	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.4	338	652	5.63	39.0	0.3	-0.01
					7	0.6	428	820	5.96	41.6	0.4	-0.01
					8	-	-	-	-	-	-	-
					9	0.9	1930	3658	7.67	54.5	1.9	0.00
					10	-	-	-	-	-	-	-
					11	1.4	7171	13343	10.09	75.5	7.3	0.00
					12	-	-	-	-	-	-	-
					13	1.9	12988	23734	13.87	109.9	13.7	0.00
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling	**SAMPLING DATE:** 4/18/2018
MICHAEL BAKER FIELD PERSONNEL: Chris Siok	**SUBMITTED BY:** S. Eklund
UMIAQ FIELD PERSONNEL: Ryan Rencehausen	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Colville River Ice Bridge	**WEATHER:** 8°F, 30 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, April 17 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on April 18, Mr. Siok attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Colville River via Hägglund tracked vehicle and began sampling at 9:50 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at locations 400, 800, and 1,200 feet both upstream and downstream of the Colville River Ice Bridge centerline. Specific conductance (SC) was calculated using water temperature and conductivity. The presence of flow was determined by measuring water velocity 1,200 feet downstream of the Colville River Ice Bridge centerline. All measurements were made from below the ice surface to the river bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI ProPlus meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. Water velocity was measured using a HACH FH950 velocity meter. The ProPlus and ProODO meters were calibrated for conductivity and DO, respectively, the morning prior to sampling.

2. COLVILLE RIVER WATER QUALITY RESULTS

At all sampling locations, SC ranged from a minimum of 499 microsiemens per centimeter (µS/cm) at 400 feet upstream to a maximum of 25,656 µS/cm at 1,200 feet upstream.

The DO saturation ranged between 36.6 percent (%) and 119.2%, with an average of 67.0%.

Velocities measured at 1,200 feet downstream of the ice bridge centerline ranged from a minimum of 0.02 feet per second (ft/s) in the downstream direction at 10-foot depth to a maximum of 0.08 ft/s in the downstream direction at 12-foot depth; average velocity was 0.04 ft/s in the downstream direction. The accuracy of the velocity measurements is +/- 0.05 ft/s.

Ice thickness ranged between 4.2 feet and 4.9 feet; average ice thickness was 4.5 feet. Snow depth ranged from 0.4 feet to 0.8 feet; average snow thickness was 0.5 feet.

Water quality parameters upstream and downstream of the Colville River Ice Bridge are included in Table 1 and Table 2. Comparison of SC at all sample locations is presented in Graph 1. This was the final sampling event of the season.

Table 1: Water Quality Parameters Upstream of the Colville River Ice Bridge

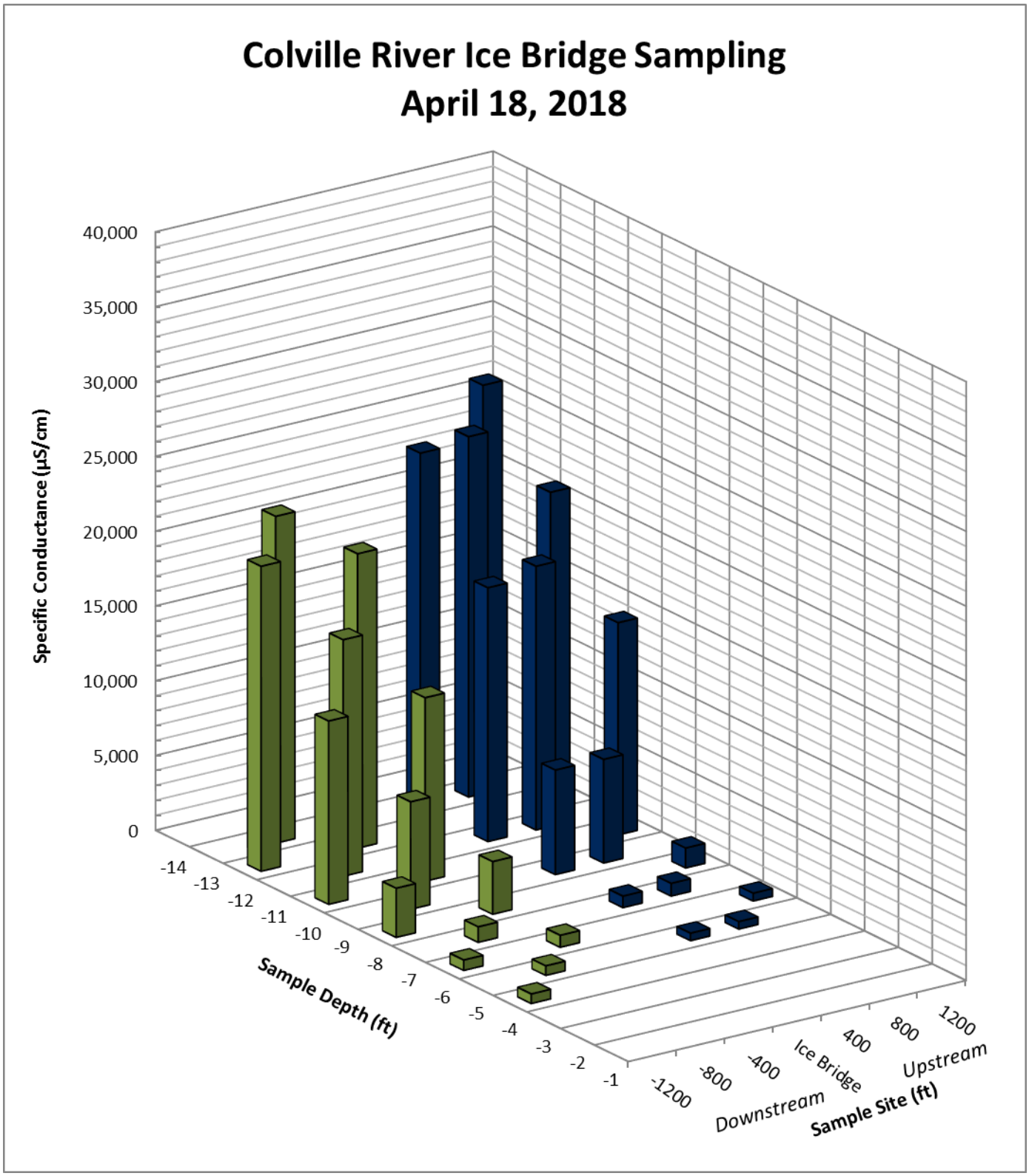
Upstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Upstream N70°14'13.4" W150°50'10.1" **10:38 AM**	14.0	4.3	0.5	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.2	256	499	5.31	36.6	0.2	-
					6	-	-	-	-	-	-	-
					7	0.6	400	767	6.88	48.0	0.4	-
					8	-	-	-	-	-	-	-
					9	1.0	3700	6986	9.15	66.0	3.6	-
					10	-	-	-	-	-	-	-
					11	1.2	9052	16967	10.76	81.4	9.7	-
					12	-	-	-	-	-	-	-
					13	1.8	12956	23760	11.14	88.2	14.0	-
					14	-	-	-	-	-	-	-
800-ft Upstream N70°14'09.8" W150°50'06.7" **10:20 AM**	13.5	4.2	0.8	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.1	256	500	5.43	37.3	0.2	-
					6	-	-	-	-	-	-	-
					7	0.6	442	846	6.25	43.6	0.4	-
					8	-	-	-	-	-	-	-
					9	1.0	3669	6928	9.56	69.0	3.7	-
					10	-	-	-	-	-	-	-
					11	1.2	9407	17632	10.86	82.2	9.9	-
					12	-	-	-	-	-	-	-
					13	1.8	13136	24090	10.27	81.3	13.9	-
					14	-	-	-	-	-	-	-
1200-ft Upstream N70°14'06.0" W150°50'02.8" **9:50 AM**	14.5	4.2	0.4	0.3	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.5	271	521	5.35	37.2	0.2	-
					7	-	-	-	-	-	-	-
					8	0.7	697	1331	6.42	45.0	0.7	-
					9	-	-	-	-	-	-	-
					10	1.2	7570	14189	10.21	76.2	7.8	-
					11	-	-	-	-	-	-	-
					12	1.4	11126	20702	11.31	87.2	11.7	-
					13	-	-	-	-	-	-	-
					14	1.9	14040	25656	14.92	119.2	14.9	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C

Table 2: Water Quality Parameters Downstream of the Colville River Ice Bridge

Downstream Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	Velocity (ft/sec)
400-ft Downstream N70°14'21.1" W150°50'17.1" **11:35 AM**	12.5	4.9	0.5	0.5	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	-	-	-	-	-	-	-
					6	0.4	414	799	6.43	44.6	0.4	-
					7	-	-	-	-	-	-	-
					8	0.9	1856	3518	9.07	64.4	1.7	-
					9	-	-	-	-	-	-	-
					10	1.3	6566	12262	10.53	78.2	6.7	-
					11	-	-	-	-	-	-	-
					12	1.2	10499	19679	11.20	85.6	11.2	-
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-
800-ft Downstream N70°14'24.8" W150°50'20.6" **11:13 AM**	13.7	4.8	0.4	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	-	-	-	-	-	-	-
					5	0.4	329	635	5.73	39.7	0.3	-
					6	-	-	-	-	-	-	-
					7	0.6	540	1035	6.65	46.4	0.5	-
					8	-	-	-	-	-	-	-
					9	1.4	3859	7180	9.73	71.0	3.8	-
					10	-	-	-	-	-	-	-
					11	1.6	8557	15806	11.66	88.6	8.8	-
					12	-	-	-	-	-	-	-
					13	2.0	12000	21850	12.16	95.8	12.6	-
					14	-	-	-	-	-	-	-
1200-ft Downstream N70°14'28.7" W150°50'24.2" **12:15 PM**	13.0	4.7	0.6	0.4	1	-	-	-	-	-	-	-
					2	-	-	-	-	-	-	-
					3	-	-	-	-	-	-	-
					4	0.1	325	635	6.21	42.7	0.3	-
					5	0.0	-	-	-	-	-	0.04
					6	0.4	359	694	6.53	45.3	0.3	0.05
					7	-	-	-	-	-	-	-
					8	1.0	1738	3282	9.08	64.6	1.6	0.03
					9	-	-	-	-	-	-	-
					10	1.6	6632	12251	10.97	82.2	6.7	0.02
					11	-	-	-	-	-	-	-
					12	1.6	11036	20386	12.38	95.9	11.6	0.08
					13	-	-	-	-	-	-	-
					14	-	-	-	-	-	-	-

Notes:
(1) All sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) Velocity was measured using a Hach FH950, which has a zero stability of +/- 0.05 ft/s and an accuracy of +/- 2% of reading + zero stability.



Graph 1: Comparison of Specific Conductance Upstream and Downstream of the Colville River Ice Bridge

B.2 ASRC Minesite 2005 Cell

PROJECT NAME: Minesite Water Quality Data Collection	**SAMPLING DATE:** 1/17/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): ASRC Minesite	**WEATHER:** 15°F, 15mph E wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, January 16 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on January 17, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the ASRC Minesite 2005 Cell via Hägglund tracked vehicle and began sampling at 12:00 PM. There are currently no active pumping operations or equipment at the ASRC Minesite 2005 Cell. Samples were collected at the center of the constructed pumphouse ice pad, located at latitude/longitude N70.2357°/W150.8040°.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the ASRC Minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the January 17 visit. At 12:00 PM, 2 liters of water were collected from a hole drilled in the ice at the pumphouse site. At the time of collection, pH was recorded to be 7.1 and the temperature was 0.1°C. Upon returning to CD1, a settleable solids test was performed from 2:00 PM to 3:00 PM. The settleable solids results were 0.0 mL/L. Results of the January 17 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for January 24, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: Minesite Water Quality Data Collection	**SAMPLING DATE:** 1/24/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Ryan Rencehausen	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** -30°F, 10mph W wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Wednesday, January 24 at 12:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 1:00 PM Mr. Roe and UMIAQ personnel conducted a health and safety meeting then traveled to the Colville River via Hägglund tracked vehicle. Sampling began at 4:35 PM. There are currently no active pumping operations or equipment at the ASRC Minesite 2005 Cell. Samples were collected at the center of the constructed pumphouse ice pad, located at latitude/longitude N70.2357°/W150.8040°.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the January 24 visit. At 4:35 PM, 2 liters of surface water were collected via bailer from a hole drilled in the ice at the pumphouse site. At the time of collection, pH was recorded to be 7.2 and the temperature was 0.0°C. Upon returning to CD1, a settleable solids test was performed from 6:20 PM to 7:20 PM. The settleable solids results were 0.0 mL/L. Results of the January 24 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for January 31, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 1/31/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Roy Baldwin	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** -2°F, 5-10mph W wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, January 30 at 5:30 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM Ms. Runa attended UMIAQ's daily health and safety meeting. Sampling began at 1:15 PM. There are currently no active pumping operations or equipment at the ASRC Minesite 2005 Cell. Samples were collected at the center of the constructed pumphouse ice pad, located at latitude/longitude N70.2357°/W150.8040°.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the January 31 visit. At 1:15 PM, 2 liters of surface water were collected via bailer from a hole drilled in the ice at the pumphouse site. At the time of collection, pH was recorded to be 7.0 and the temperature was 0.6°C. Upon returning to CD1, a settleable solids test was performed from 2:50 PM to 3:50 PM. The settleable solids results were 0.0 mL/L. Results of the January 31 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for February 7, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 2/7/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** -10°F, 15mph W wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 6 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 06:00 AM on February 7, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 12:04 PM. There are currently no active pumping operations or equipment at the ASRC Minesite 2005 Cell. Samples were collected from the water adjacent to the center of the grounded pumphouse ice pad, located at latitude/longitude N70.2357°/W150.8040°.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the February 7 visit. At 12:40 PM, 2 liters of surface water were collected via bailer from a hole drilled in the ice. At the time of collection, pH was 6.7 and the temperature was 0.1°C. Upon returning to CD1, a settleable solids test was performed from 4:00 PM to 5:00 PM. The settleable solids results were 0.0 mL/L. Results of the February 7 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for February 14, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 2/14/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** -18 TO 19°F, 0 to 37 mph ESE wind, snow

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 13 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 14, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 3:20 PM. Sampling was delayed by Phase 2 weather conditions in the morning. Nanuq has installed a pumphouse at the ASRC Minesite 2005 Cell. Samples were collected from the open hole inside the pumphouse.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the February 14 visit. At 12:40 PM, 2 liters of surface water were collected via bailer from the pumphouse open hole. At the time of collection, pH was 6.9 and the temperature was 1.1°C. Upon returning to CD1, a settleable solids test was performed from 7:15 PM to 8:15 PM. The settleable solids results were 0.0 mL/L. Results of the February 14 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for February 21, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 2/21/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Ryan Rencehausen	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** 20°F, 16 mph WSW wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 20 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 21, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 11:45 AM. Nanuq/AFC and Peak have installed pumphouses at the ASRC Minesite 2005 Cell. Samples were collected from the truck transfer hose on the southeast side of the Nanuq/AFC pumphouse.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the February 21 visit. At 11:45 AM, 2 liters of surface water were collected from the pumphouse truck transfer hose. At the time of collection, pH was 6.7 and the temperature was 1.5°C. Upon returning to CD1, a settleable solids test was performed from 2:00 PM to 3:00 PM. The settleable solids results were 0.0 mL/L. Results of the February 21 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for February 28, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 2/28/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** -29°F, 9 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 27 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 28, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 12:36 PM. Nanuq and Peak have installed pumphouses at the ASRC Minesite 2005 Cell. Samples were collected from the truck transfer hose on the southeast side of the Nanuq pumphouse.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the February 28 visit. At 12:36 PM, 2 liters of surface water were collected from the pumphouse truck transfer hose. At the time of collection, pH was 7.6 and the temperature was 1.5°C. Upon returning to CD1, a settleable solids test was performed from 2:00 PM to 3:00 PM. The settleable solids results were 0.0 mL/L. Results of the February 28 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for March 7, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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08/08/2013

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 3/7/2018
MICHAEL BAKER FIELD PERSONNEL: Garrett Yager	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** 6°F, 5 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, March 6 at 7:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on March 7, Mr. Yager attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 11:05 AM. Nanuq and Peak have installed pumphouses at the ASRC Minesite 2005 Cell. Samples were collected from the truck transfer hose on the southeast side of the Nanuq pumphouse.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the March 7 visit. At 11:05 AM, 2 liters of surface water were collected from the pumphouse truck transfer hose. At the time of collection, pH was 6.8 and the temperature was 1.7°C. Upon returning to CD1, a settleable solids test was performed from 12:57 PM to 1:57 PM. The settleable solids results were 0.0 mL/L. Results of the March 7 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for March 14, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 3/14/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Ryan Renchausen	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** -3°F, 15 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, March 13 at 6:30 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on March 14, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 1:10 PM. Nanuq and Peak have installed pumphouses at the ASRC Minesite 2005 Cell. Samples were collected from the truck transfer hose on the southeast side of the Nanuq pumphouse.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the March 14 visit. At 1:10 PM, 2 liters of surface water were collected from the pumphouse truck transfer hose. At the time of collection, pH was 6.9 and the temperature was 2.5°C. Upon returning to CD1, a settleable solids test was performed from 2:35 PM to 3:35 PM. The settleable solids results were 0.0 mL/L. Results of the March 14 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for March 21, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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08/08/2013

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 3/21/2018
MICHAEL BAKER FIELD PERSONNEL: Jen Gillenwater	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Ryan Renchausen	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** -8°F, <15 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, March 20 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on March 21, Ms. Gillenwater attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 12:28 PM. Nanuq and Peak have installed pumphouses at the ASRC Minesite 2005 Cell. Samples were collected from the truck transfer hose on the southeast side of the Nanuq pumphouse.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the March 21 visit. At 12:28 PM, 2 liters of surface water were collected from the pumphouse truck transfer hose. At the time of collection, pH was 7.2 and the temperature was 2.0°C. Upon returning to CD1, a settleable solids test was performed from 1:30 PM to 2:30 PM. The settleable solids results were 0.0 mL/L. Results of the March 21 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for March 28, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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08/08/2013

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 3/28/2018
MICHAEL BAKER FIELD PERSONNEL: Garrett Yager	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Jaron Varga	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** -8°F, 6 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, March 27 at 5:30 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on March 28, Mr. Yager attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 11:20 AM. Nanuq and Peak have installed pumphouses at the ASRC Minesite 2005 Cell. Samples were collected from the truck transfer hose on the southeast side of the Nanuq pumphouse.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the March 28 visit. At 11:20 AM, 2 liters of surface water were collected from the pumphouse truck transfer hose. At the time of collection, pH was 7.0 and the temperature was 0.8°C. Upon returning to CD1, a settleable solids test was performed from 12:35 PM to 1:35 PM. The settleable solids results were 0.0 mL/L. Results of the March 28 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for April 4, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Rev. 1
08/08/2013

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 4/4/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Jim Estes	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2005	**WEATHER:** 0°F, 15 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, April 3 at 5:30 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on April 4, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2005 via Hägglund tracked vehicle and began sampling at 2:00 PM. Nanuq and Peak have installed pumphouses at the ASRC Minesite 2005 Cell, but Peak's pump house has been removed. Samples were collected from the truck transfer hose on the southeast side of the Nanuq pumphouse.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.*

No oily sheen was observed during the April 4 visit. At 2:00 PM, 2 liters of surface water were collected from the pumphouse truck transfer hose. At the time of collection, pH was 6.8 and the temperature was 5.2°C. Upon returning to CD1, a settleable solids test was performed from 3:25 PM to 4:25 PM. The settleable solids results were 0.0 mL/L. Results of the April 4 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for April 11, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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08/08/2013

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

B.3 ASRC Minesite 2017 Cell

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 2/7/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2017	**WEATHER:** -10°F, 15mph W wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 6 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 7, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2017 via Hägglund track vehicles and began sampling at 1:47 PM. There are currently no active pumping operations or equipment at the ASRC Minesite 2017 Cell. Samples were collected where surface water was present, at the bottom of the minesite; latitude/longitude N70.22870°/W150.78886°.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.* Water sample turbidity was measured using a HACH 2100P turbidity meter, in compliance with EPA method 180.1 and ISO 7027.

No oily sheen was observed during the February 7 visit. At 1:47 PM, 2 liters of surface water were collected via bailer from a hole drilled in the ice. At the time of collection, the pH was 7.4 and the temperature was 0.4°C. Upon returning to CD1, turbidity was measured at 2.52 NTU. A settleable solids test was performed from 5:00 PM to 6:00 PM; results were 0.0 mL/L. Results of the February 7 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for February 14, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 2/14/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2017	**WEATHER:** -18 to 19°F, 0 to 37 mph ESE wind, snow

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 13 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 14, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2017 via Hägglund track vehicles and began sampling at 3:50 PM. Sampling was delayed because of Phase 2 weather conditions in the morning. There are currently no active pumping operations or equipment at the ASRC Minesite 2017 Cell. Samples were collected where surface water was present, at the bottom of the minesite; latitude/longitude N70.22870°/W150.78886°.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.* Water sample turbidity was measured using a HACH 2100P turbidity meter, in compliance with EPA method 180.1 and ISO 7027.

No oily sheen was observed during the February 14 visit. At 3:50 PM, 2 liters of surface water were collected via bailer from a hole drilled in the ice. At the time of collection, the pH was 7.4 and the temperature was 1.2°C. Upon returning to CD1, turbidity was measured at 2.55 NTU. A settleable solids test was performed from 8:20 PM to 9:20 PM; results were 0.0 mL/L. Results of the February 7 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for February 21, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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08/08/2013

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 2/21/2018
MICHAEL BAKER FIELD PERSONNEL: Devon Roe	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Ryan Rencehausen	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2017	**WEATHER:** 20°F, 16 mph WSW wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 20 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 21, Mr. Roe attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2017 via Hägglund tracked vehicle and began sampling at 12:07 PM. AFC installed a pump house at the minesite. The sample was taken from the by-pass hose next to the intake hose within the pump house. The AFC lead on-site assisted in getting down to the pump house and collecting the sample.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.* Water sample turbidity was measured using a HF Scientific Micro TPW turbidity meter, in compliance with EPA method 180.1 and ISO 7027.

No oily sheen was observed during the February 21 visit. At 12:07 PM, 2 liters of surface water were collected from the pumphouse by-pass hose. At the time of collection, the pH was 7.6 and the temperature was 1.5°C. Upon returning to CD1, turbidity was measured at 1.25 NTU. A settleable solids test was performed from 2:00 PM to 3:00 PM; results were 0.0 mL/L. Results of the February 21 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. The next monitoring event is scheduled for February 28, 2018.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

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08/08/2013

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

PROJECT NAME: 2017/2018 Alpine Ice Road Support Water Quality Sampling - Minesite Water Quality Data Collection	**SAMPLING DATE:** 2/28/2018
MICHAEL BAKER FIELD PERSONNEL: Haley Runa	**SUBMITTED BY:** S. EKLUND
UMIAQ FIELD PERSONNEL: Tim Burnett	**PROJECT CODE:** 162998
SAMPLE LOCATION(S): Minesite 2017	**WEATHER:** -29°F, 9 mph wind

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, February 27 at 6:00 PM and coordinated with UMIAQ, LLC (UMIAQ) to schedule transportation support. At 6:00 AM on February 28, Ms. Runa attended UMIAQ's daily health and safety meeting. UMIAQ and Michael Baker personnel then traveled to the Minesite 2017 via Hägglund tracked vehicle and began sampling at 12:16 PM. AFC installed a pump house at the minesite. The sample was taken from the by-pass hose next to the intake hose within the pump house. The AFC lead on-site assisted in getting down to the pump house and collecting the sample.

Visual observations for an oily sheen or lack thereof and temperature and pH measurements were collected at the minesite at the time of sampling. An Imhoff Cone Test was performed for water sampled from the following the methods outlined in *The Standard Methods for the Examination of Water and Wastewater: 2540A and 2540F, Settleable Solids.* Water sample turbidity was measured using a HF Scientific Micro TPW turbidity meter, in compliance with EPA method 180.1 and ISO 7027.

No oily sheen was observed during the February 28 visit. At 12:16 PM, 2 liters of surface water were collected from the pumphouse by-pass hose. At the time of collection, the pH was 6.8 and the temperature was 1.4°C. Upon returning to CD1, turbidity was measured at 24.64 NTU. A settleable solids test was performed from 1:35 PM to 2:35 PM; results were 0.0 mL/L. Results of the February 28 monitoring event are included in the attached APDES Discharge Sampling Form, provided by ConocoPhillips. Dewatering of the Minesite 2017 is now complete and this concludes monitoring at this cell for the 2017/2018 ice road season.

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

Sample Location: ASRC Minesite 2005 Cell

Analysis Location: ASRC Minesite and Alpine CD1

Daily Analysis				Sampling Information			
Day	**Date**	**Analysis**	**Type**	**Time**	**Name**	**Result**	**Units**
Monday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Tuesday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Wednesday	01/17/18	Total Flow	Estimate				MG
		Oily Sheen	Visual	12:00	Devon Roe	No Oily Sheen	-
Thursday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Friday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Saturday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-
Sunday		Total Flow	Estimate				MG
		Oily Sheen	Visual				-

Notes:

Weekly Analysis				Sampling Information		Analysis Information				
Day	**Date**	**Analysis**	**Type**	**Time**	**Sampler Name**	**Analyist's Name**	**Time**	**Technique**	**Result**	**Units**
Wednesda	01/17/18	pH	1 L Grab	12:00	Devon Roe	Devon Roe	12:02	Digital pH	7.1	SU
		S. Solids	1 L Grab	12:00	Devon Roe	Devon Roe	15:00	1 L Cone	0.0	ml/L

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Rev. 1
08/08/2013

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

ConocoPhillips Alpine Resupply Ice Road
ASRC Minesite Water Withdrawal

APDES Discharge Sampling Form

ConocoPhillips

General Instructions: This form is to be kept on site while dewatering each week. Once the form has been completely filled out it should be e-mailed to Exploration Environmental (n1662@conocophillips.com). Be sure all fields are filled out completely on a daily basis. Sample location should always be the effluent/discharge location, and should be described as such. Analysis location should be the on-site work location in which the sample analysis was performed. Instructions for the individual monitoring requirements are described below.

Total Flow: Regulatory requirements limit the total flow during dewatering to **3 million gallons per day** (per 24 hours).

- Flow estimations are made from effluent source (discharge point),
- Flow calculated by surveying, flow meters, flow tests, or pump rate calculations (RPM and head pressure taken into consideration).
- **Document the time (end of day), name, and estimated total water discharged (in millions of gallons).**

The total flow rate is never to exceeded 3 million gallons per day. If a total flow exceedance does occur during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Oily Sheen: Regulatory requirements require all discharges to be **free of oily sheen or floating debris.**

- Visually inspect effluent/discharge location and source location for any sheening or floating debris/foam.
- The tundra may produce an organic oily sheen that is not a byproduct of hydrocarbons or releases. Determination between oily sheen and organic sheen is to be made by a qualified person only.
- **Document the time (any time during shift), name, and the presence or absence of oily sheen or floating debris/foam.**

No non-organic sheening allowed during dewatering. If an oily sheen is detected at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

pH Testing: Regulatory requirements require all discharges to have a **pH greater than or equal to 6.5 and less than or equal to 8.5 (pH = 6.5 to 8.5).**

- The pH is sampled once every week. Duplicate sample (2 samples at the same time) collected once during the project.
- One liter of water collected from discharge location in clean sample container.
- Digital pH meter should be calibrated as per the manufacturer's instructions prior to each sampling event.
- The pH reading should be collected between 5 and 15 minutes from collection.
- **Sampler to document their name and the time and date sample was collected. Tester to document name, time, and result of the pH Test.**

If the pH is determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Settleable Solids Testing: Regulatory requirements require all discharges to have a **settleable solids volume of less than or equal to 0.2 ml/L.**

- Settleable solids are sampled once every week. Duplicate sample (2 samples at the same time) completed once during the project.
- One liter of water is to be collected from discharge location in clean sample container.
- Pour the 1 liter of water into a volumetric cone, and allow it to sit for 45 minutes.
- After 45 minutes, gently tap the sides of the cone to release any solids, and allow it to sit for additional 15 minutes.
- After exactly one hour, read the measured the volume of solids collected, using the cone's volumetric markings.
- Sampler to document their name, and the time and date sample was collected. **Tester to document name, time, and result of test in milliliters (ml) of solids per Liter (L) of water.**

If the settleable solids are determined to be out of range at any point during dewatering, immediately stop the dewatering process and contact Exploration Environmental.

Contact Environmental Immediately if Sheen or other pollutant is found in discharge water, or if inital field results show deviations from the permitted range.

Permit Limits: Daily Flow - must be less than 3 MMgal per day
Weekly pH - must be between 6.5 and 8.5
Weekly Settleable Solids - must be <0.2 mL/L

Contact : Exploration Enivironmental
n1662@conocophillips.com
Cell: (907) 943-0134

B.4 Lake M0675

Michael Baker INTERNATIONAL

2016/2017 ALPINE ICE ROAD SUPPORT WATER QUALITY SAMPLING

PROJECT TRIP REPORT

PROJECT NAME: Alpine Ad Hoc Ice Bridge Sampling	**SAMPLING DATE:** 11/22/2017
MICHAEL BAKER FIELD PERSONNEL: D. Roe	**SUBMITTED BY:** H. Runa
LCMF FIELD PERSONNEL: M. Rourick	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Lake M0675	**WEATHER:** 1°F, 10 mph winds, Overcast

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, November 21, at 9:45 AM and coordinated with LCMF to schedule transportation support. On Wednesday November 22 at 6:00 AM, Mr. Roe conducted a safety meeting with LCMF personnel. LCMF and Michael Baker personnel then traveled to Lake M0675 on snow machines and began sampling at 9:35 AM.

Ice thickness, snow depth, total water depth, freeboard, temperature, salinity, conductivity, and dissolved oxygen (DO) measurements were collected at the deepest point in the lake. Specific conductance (SC) was calculated using water temperature and conductivity. All measurements were made from below the ice surface to the lake bottom at a maximum of two-foot intervals.

In-situ water quality parameters were recorded using a YSI Pro1030 meter for temperature, conductivity, and salinity and a YSI ProODO meter for DO. The YSI Pro1030 meter was calibrated for conductivity and the YSI ProODO meter was checked for DO accuracy and calibrated by TTT Environmental prior to sampling.

Ice samples were collected from ice auger cuttings obtained from the top 1.3 feet of ice. Two 1-liter ice samples were collected, transported to Alpine and thawed. Conductivity and temperature of the thawed samples were measured using the YSI Pro1030 meter. Specific conductance was calculated from conductivity and temperature. Total dissolved solids (TDS) was calculated from specific conductance.

2. LAKE M0675 WATER QUALITY RESULTS

In-situ water SC ranged from a minimum of 18,571 microsiemens per centimeter (µS/cm) at a depth of 2 feet to a maximum of 26,726 µS/cm at depth of 5 feet, with an average of 23,776 µS/cm. The water DO saturation ranged between 81.0 percent (%) and 83.0%, with an average of 82.1%. Average water TDS was 15,455 mg/L. Melted ice TDS was 765 and 756 mg/L. Ice thickness was 1.3 feet and snow depth was 0.3 feet. The water quality parameters and results for the ice samples and water column are included in Table 1.

Table 1: Lake M0675 Water Quality Parameters

Lake M0675 Monitoring
Water Quality

Michael Baker INTERNATIONAL

Sample Date: November 22, 2017

Location & Time	Water Depth (ft)	Ice Thickness (ft)	Snow Depth (ft)	Freeboard (ft)	Sample Depth (ft)	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	DO (mg/L)	DO (% Saturation)	Salinity (ppt)	TDS (mg/L)
N70°24'13.1" W151°00'32.5" 9:35 AM	6.1	1.3	0.3	0.0	Ice Sample 1	22.4	1,117	1,177	-	-	0.6	765
					Ice Sample 2	7.6	766	1,162	-	-	0.6	756
					1	-	-	-	-	-	-	-
					2	-0.3	9,362	18,571	11.27	82.2	10.3	12,071
					3	-0.2	12,139	23,986	11.10	83.0	13.6	15,591
					4	0.0	13,169	25,822	10.85	82.2	14.6	16,784
					5	0.4	13,840	26,726	10.53	81.0	15.3	17,372
					6	-	-	-	-	-	-	-

Notes:
(1) Sample location coordinates referenced to NAD83 datum.
(2) Freeboard is the distance from the top of ice to the water surface.
(3) Sample depth is measured from the water surface.
(4) Temperature, salinity, and conductivity were measured using a YSI Pro1030 meter.
(5) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data.
(6) Dissolved oxygen was measured using a YSI ProODO meter.
(7) Time shown indicates the start of the measurement.
(8) Temperature measurements have an accuracy of +/- 0.2°C
(9) TDS was calculated from Specific Conductivity using a multiplier of 0.65.

B.5 Nanuq Lake

PROJECT NAME: Alpine Ad Hoc Ice Bridge Sampling	**SAMPLING DATE:** 11/22/2017
MICHAEL BAKER FIELD PERSONNEL: D. Roe	**SUBMITTED BY:** H. Runa
LCMF FIELD PERSONNEL: M. Rourick	**PROJECT CODE:** 162998
SAMPLE LOCATIONS: Nanuq Lake Relic Site NW and Relic Site NE	**WEATHER:** 1°F, wind 10 mph

1. MONITORING EVENT DETAILS

Michael Baker International (Michael Baker) personnel arrived at Alpine on Tuesday, November 21, at 9:30 AM and coordinated with UMIAQ (LCMF) to schedule transportation support. At 6:00 AM on Wednesday, November 22, Mr. Roe attended LCMF's daily health and safety meeting. LCMF and Michael Baker personnel traveled to Nanuq Lake via snow machine and began sampling at 10:25 AM.

Ice samples were collected at two locations on Nanuq Lake; Relic Site Northwest (NW) and Relic Site Northeast (NE). Ice samples were collected from ice auger cuttings obtained from the top one foot of ice. Two 1-liter samples were collected at each site, transported to Alpine and thawed. The conductivity of the thawed samples was measured using a YSI Pro1030 water quality meter. Specific conductance was calculated from conductivity and temperature. Total dissolved solids (TDS) were calculated from specific conductance. The meter was calibrated for conductivity prior to sampling.

2. NANUQ LAKE ICE TDS RESULTS

TDS in Nanuq Lake ice averaged 23.72 mg/L and 5.17 mg/L at the NW and NE sites, respectively. The water quality parameters from all samples are included in Table 1.

Table 1: Nanuq Lake Ice - Water Quality Parameters

Michael Baker INTERNATIONAL

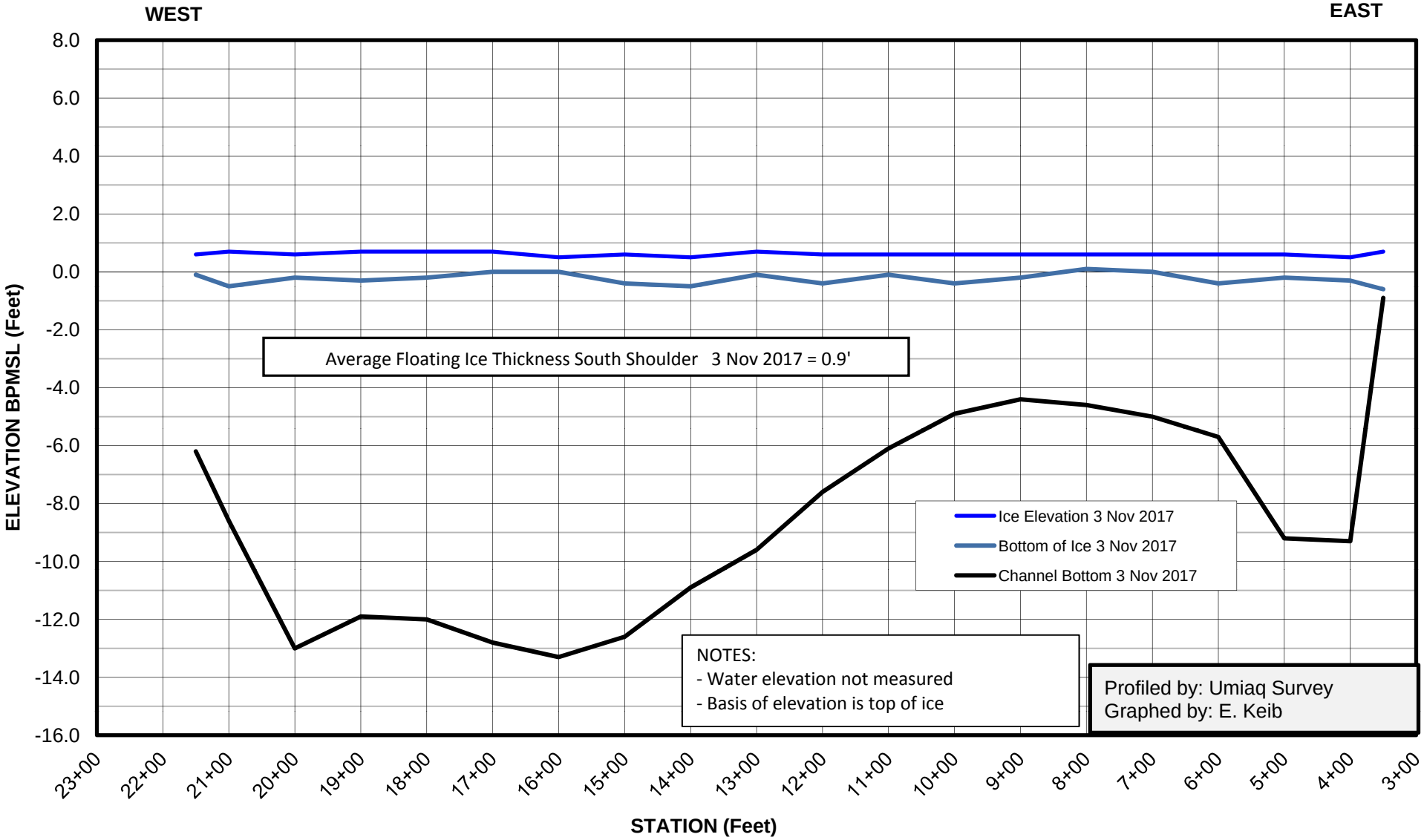
Nanuq Lake Ice **Sample Date: November 22, 2017**

Location	Sample	Temp (°C)	Conductivity (µS/cm)	Specific Conductance (µS/cm)	Salinity (ppt)	TDS (mg/L)
Relic Site NW N 70.32735 W 151.04132	1	7.9	26.6	40.0	0.0	26.0
	2	17.0	27.8	33.0	0.0	21.4
Relic Site NE N 70.32668 W 151.01176	1	16.3	8.5	10.2	0.0	6.7
	2	6.5	3.6	5.6	0.0	3.7

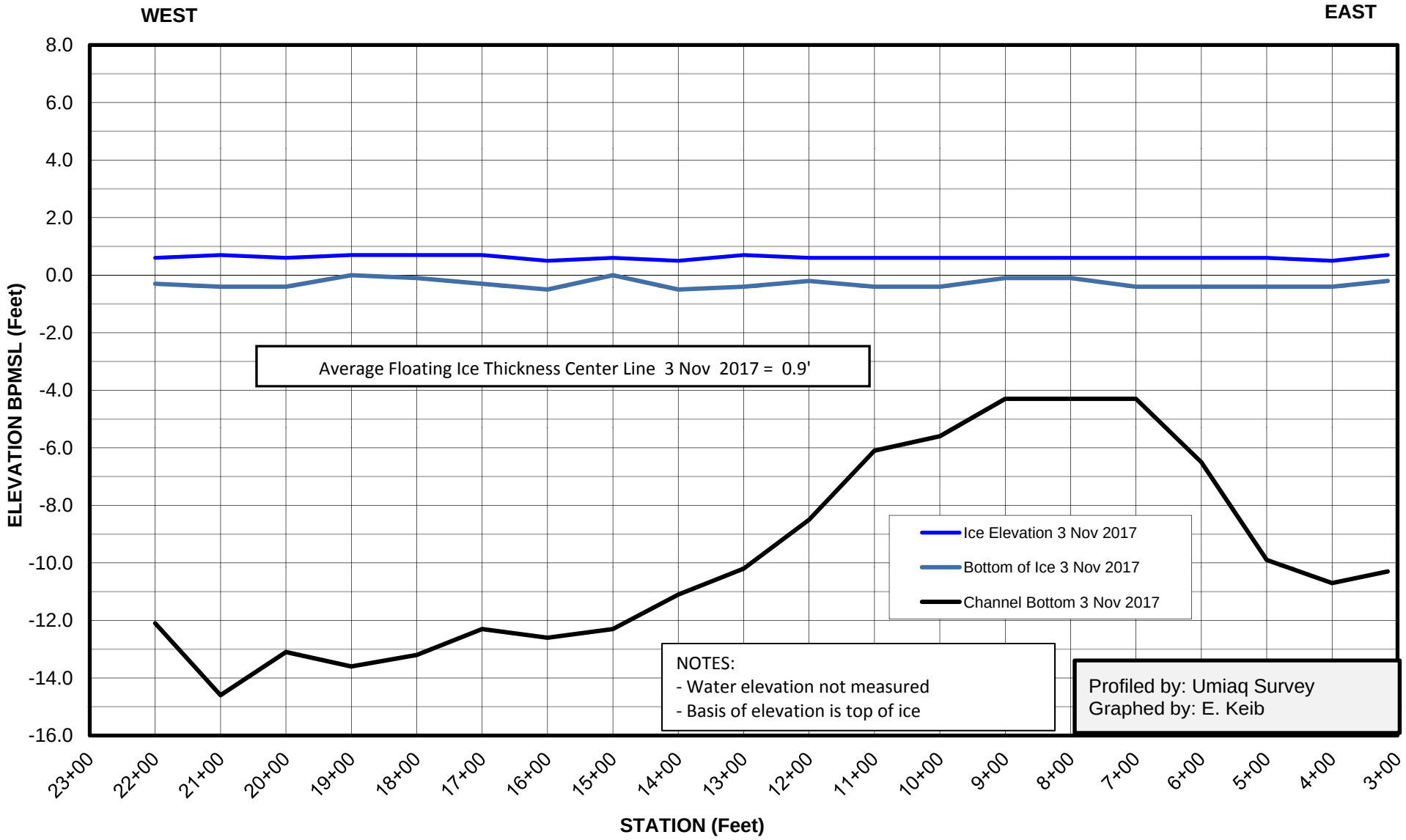
Notes:
(1) Specific conductance (referenced to 25°C) was obtained using a conversion coefficient of 0.0196 based on empirical data
(2) TDS was calculated from Specific Conductivity using a multiplier of 0.65

Attachment C Colville River Ice Bridge Crossing Profiles

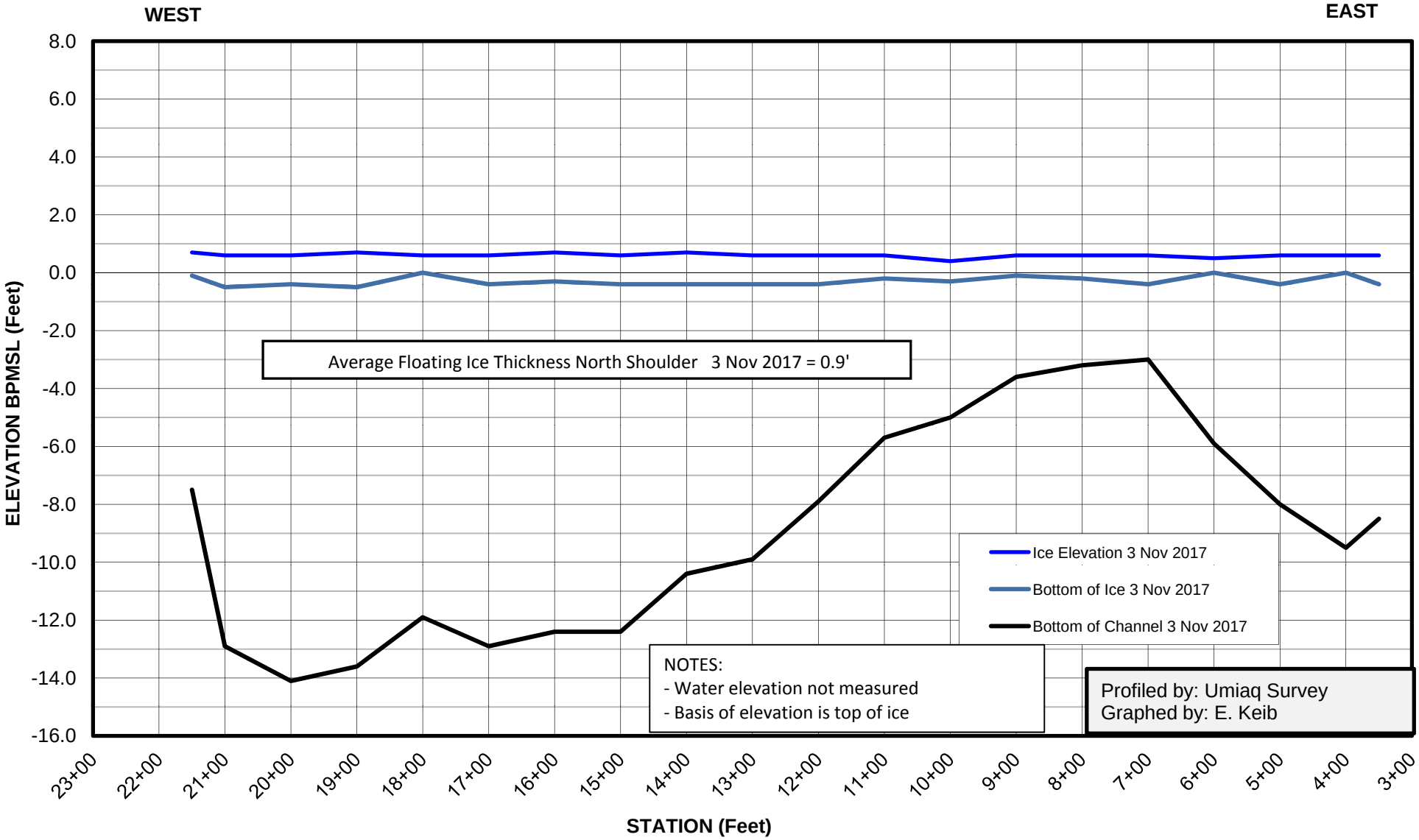
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
3 Nov 2017



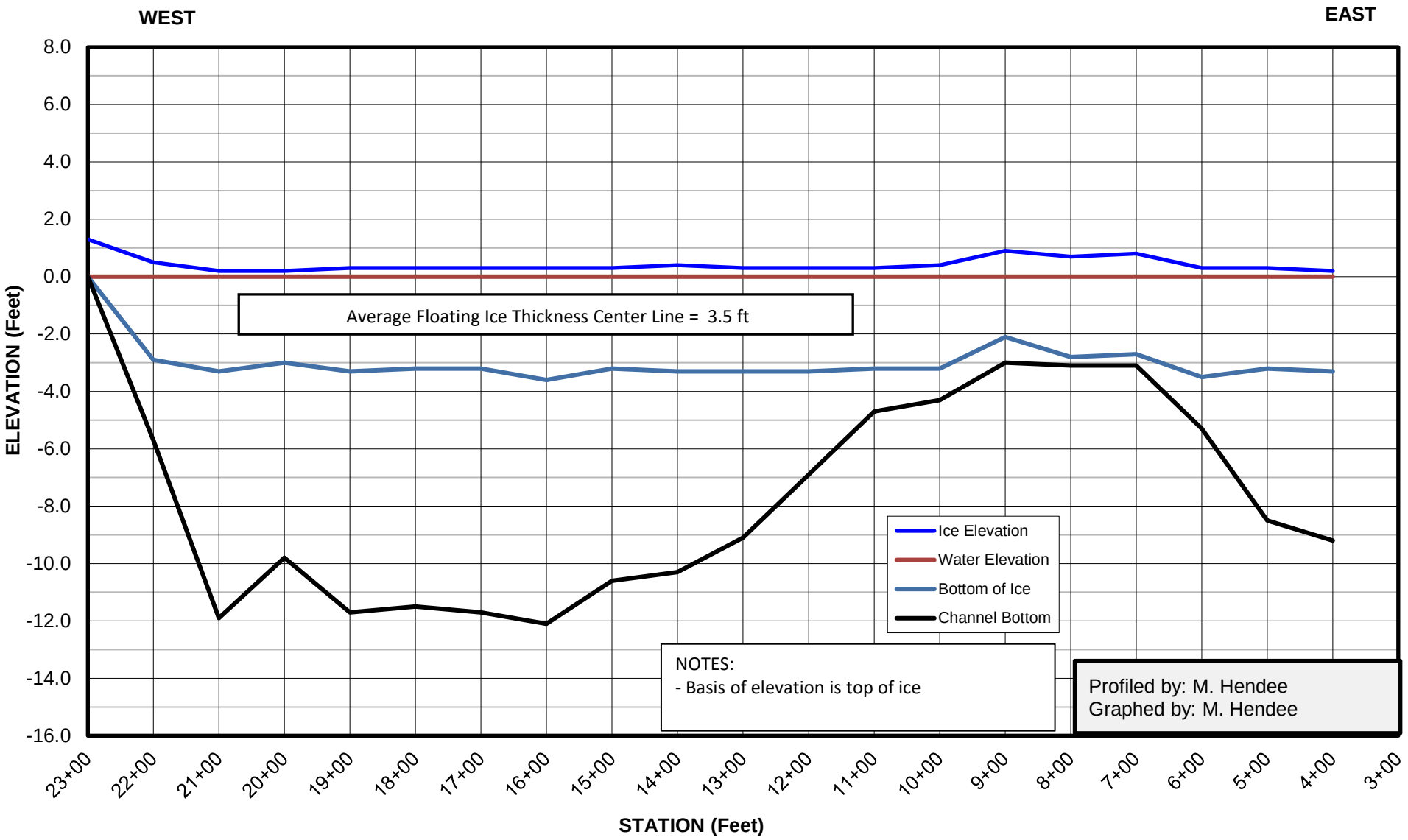
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
3 Nov 2017



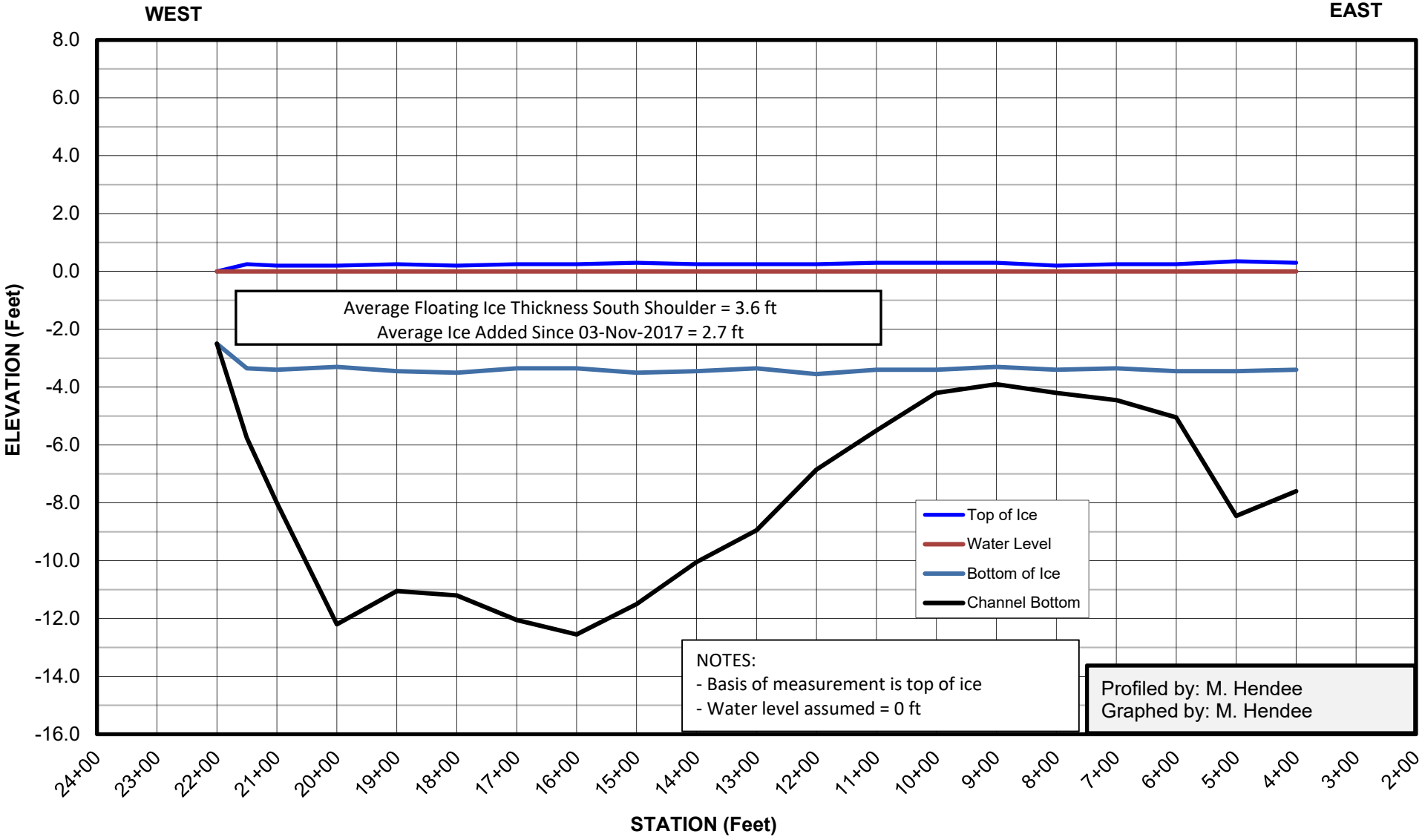
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
3 Nov 2017



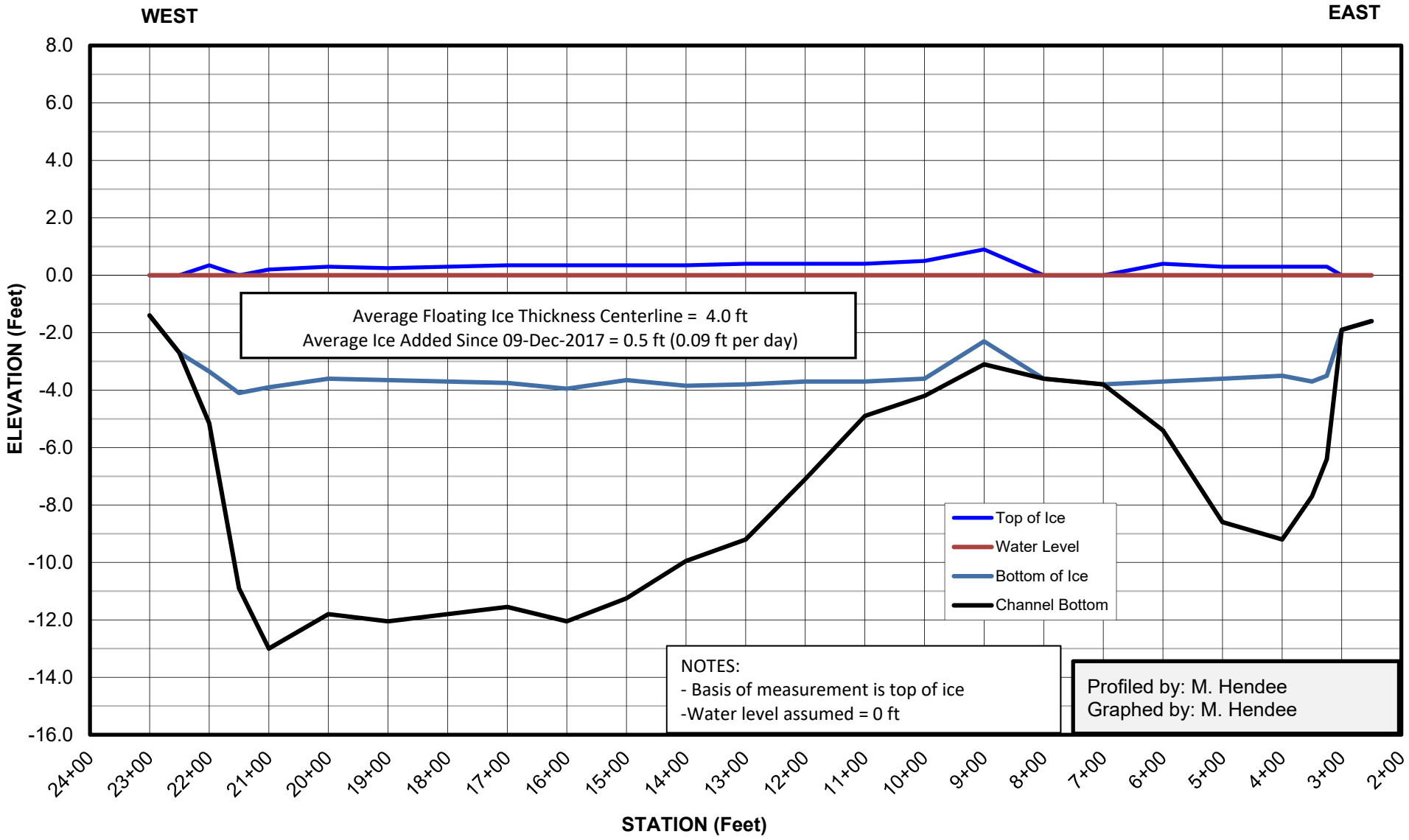
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
09-Dec-2017



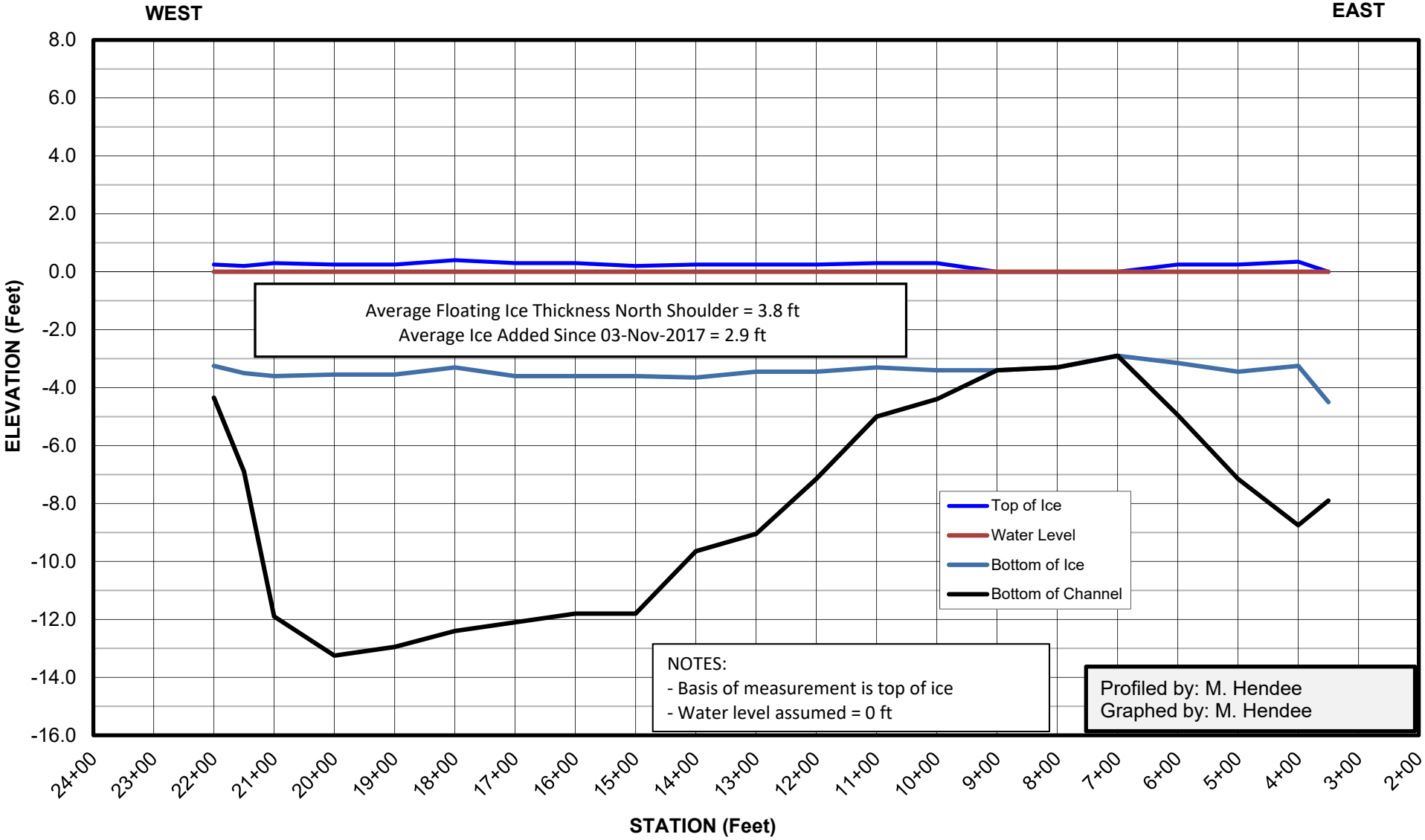
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
15-Dec-2017



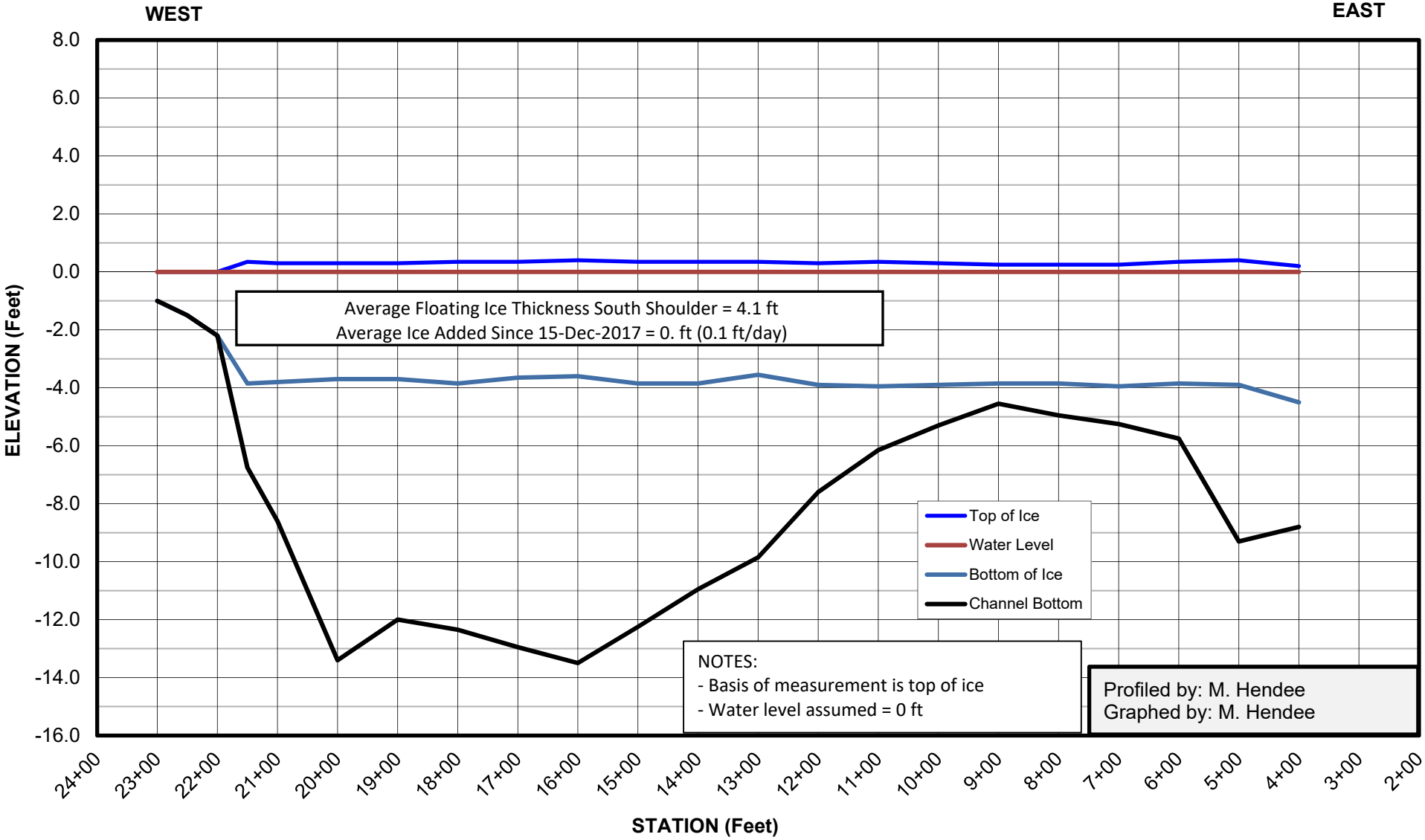
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
15-Dec-2017



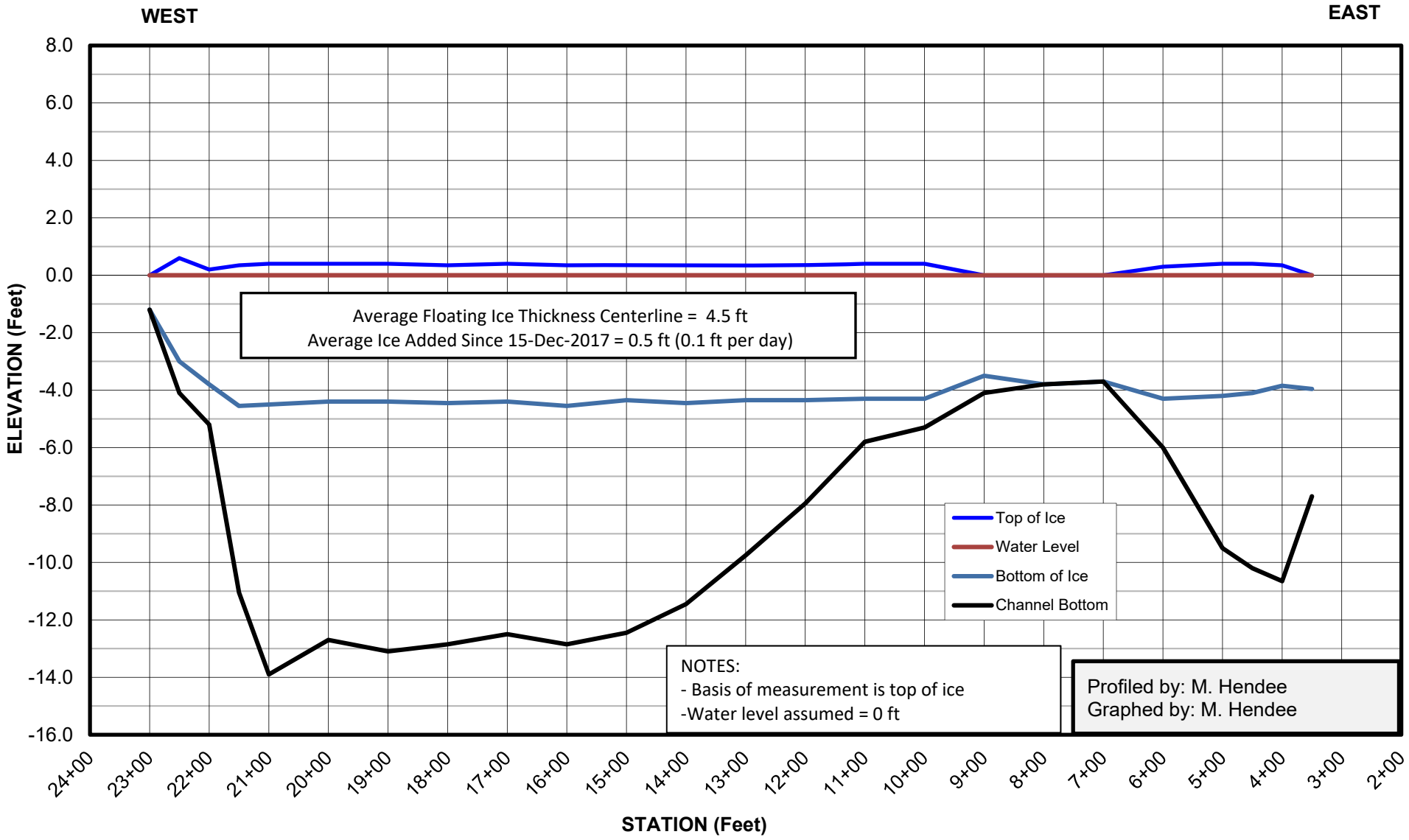
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
15-Dec-2017



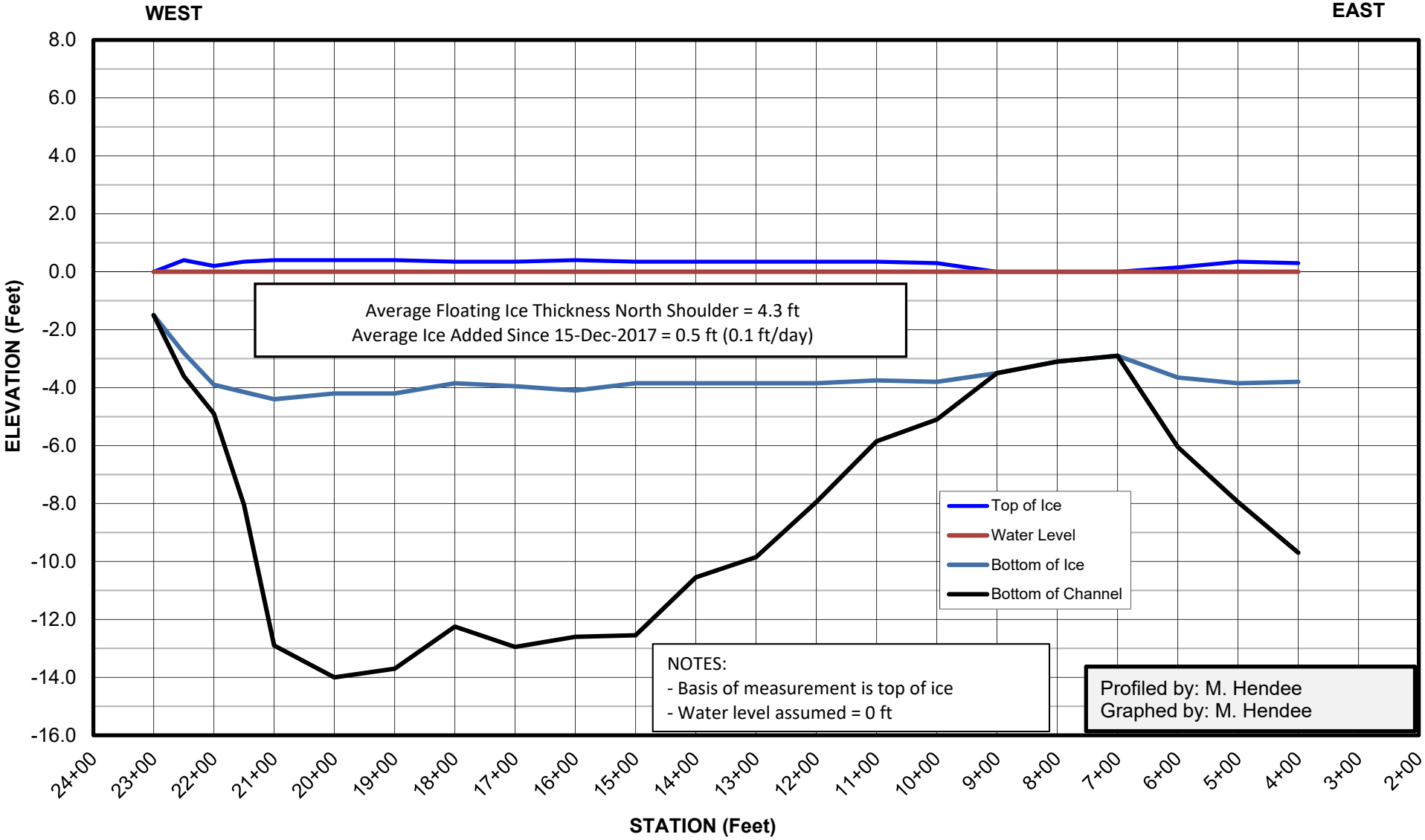
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
20-Dec-2017



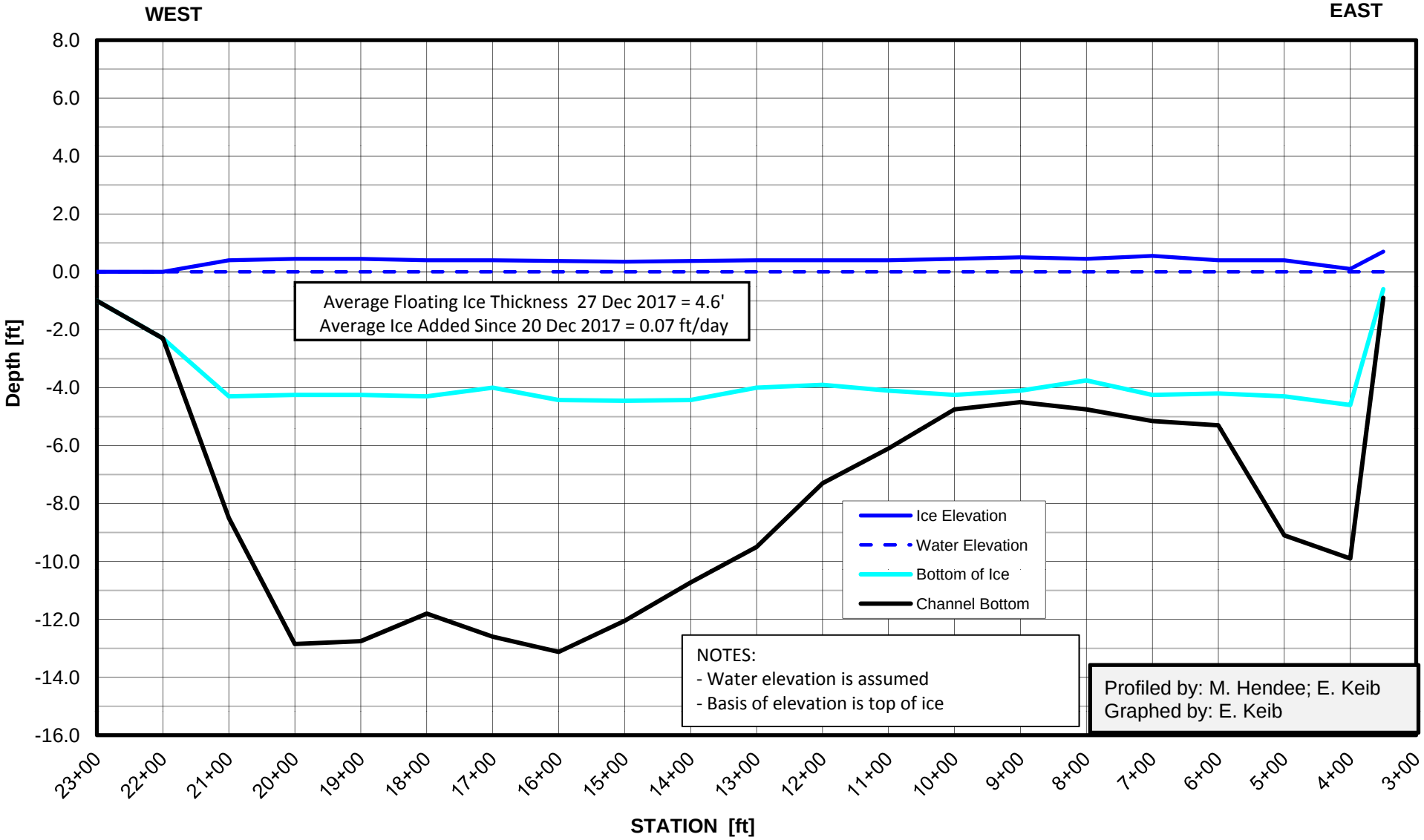
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
20-Dec-2017



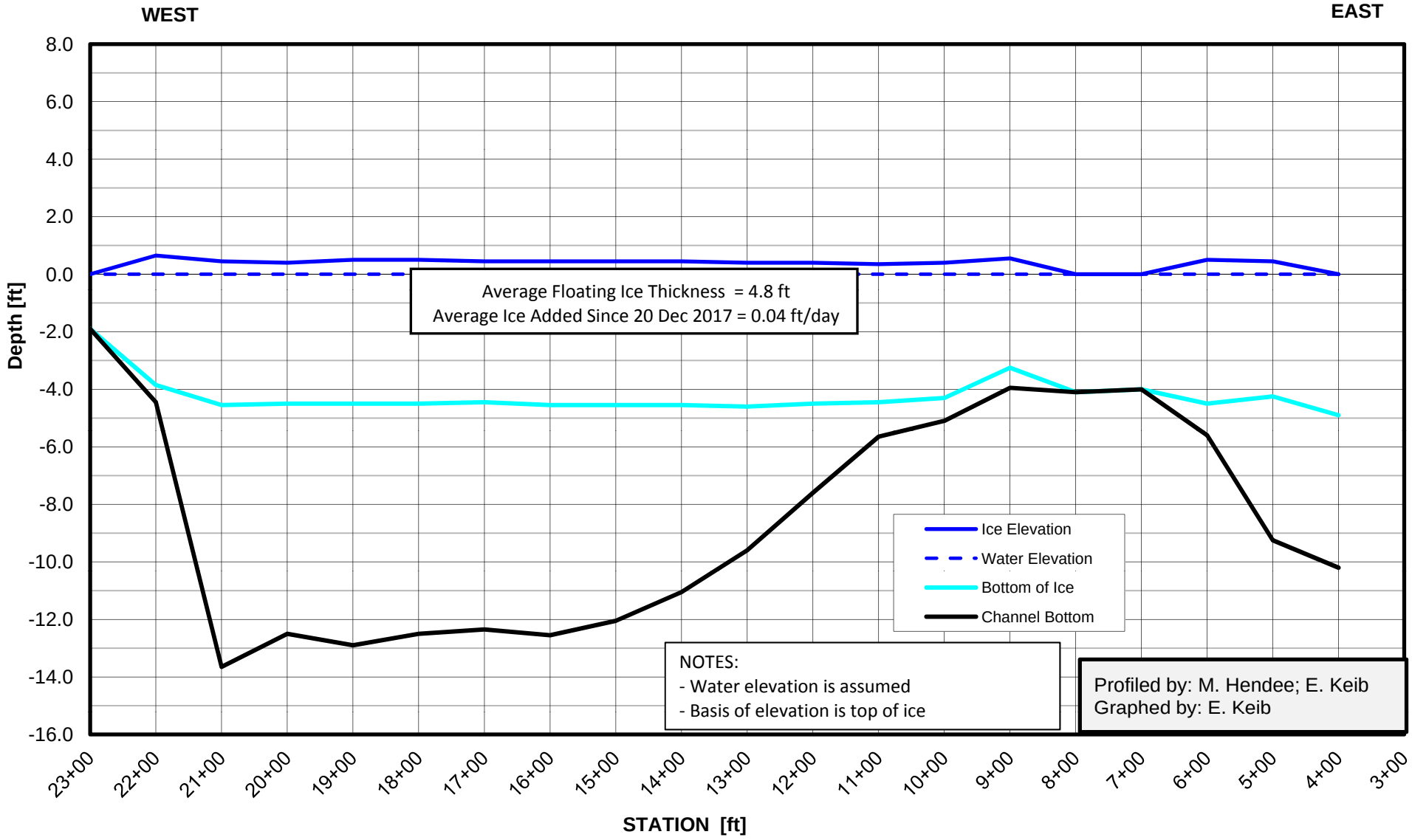
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
20-Dec-2017



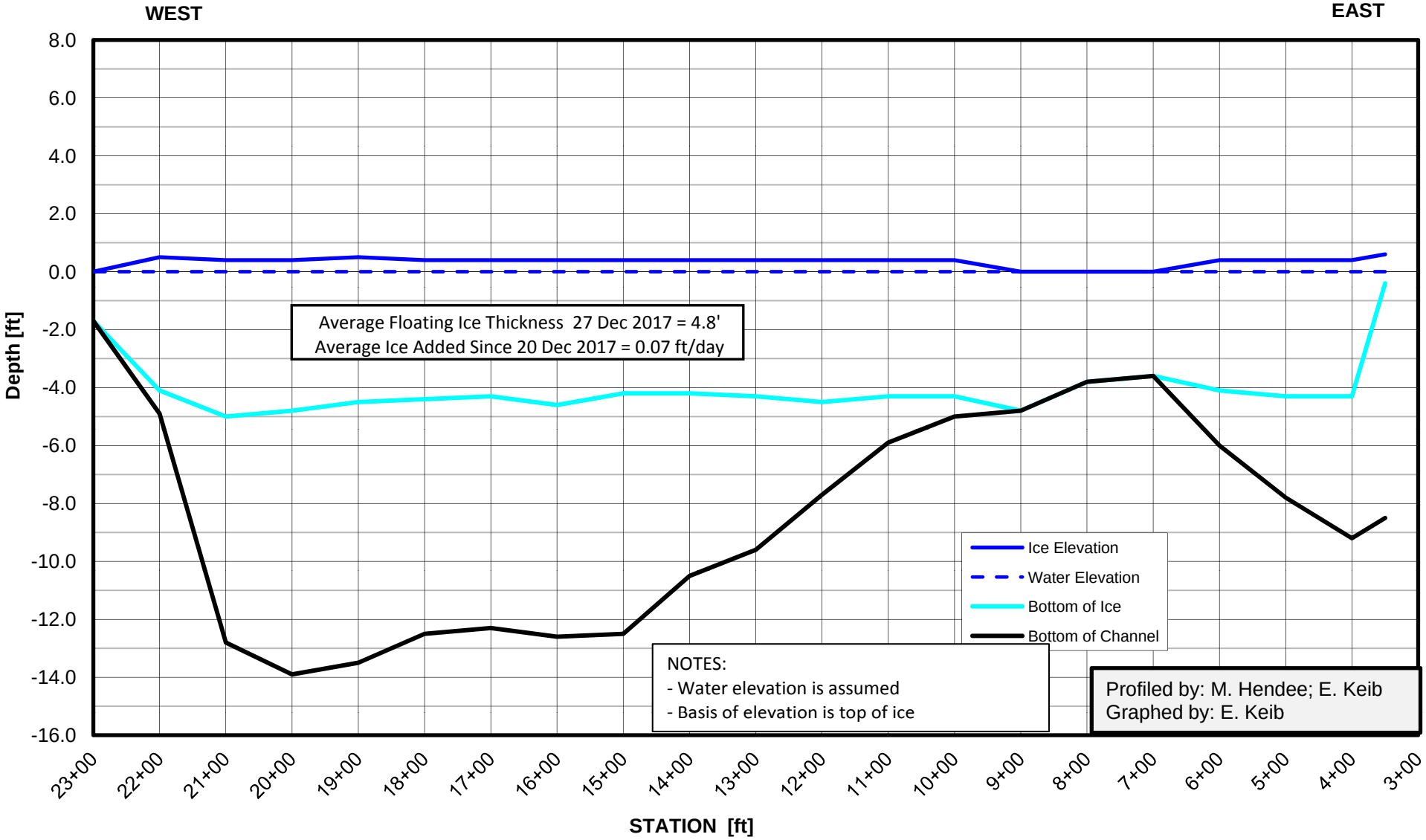
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
27 Dec 2017



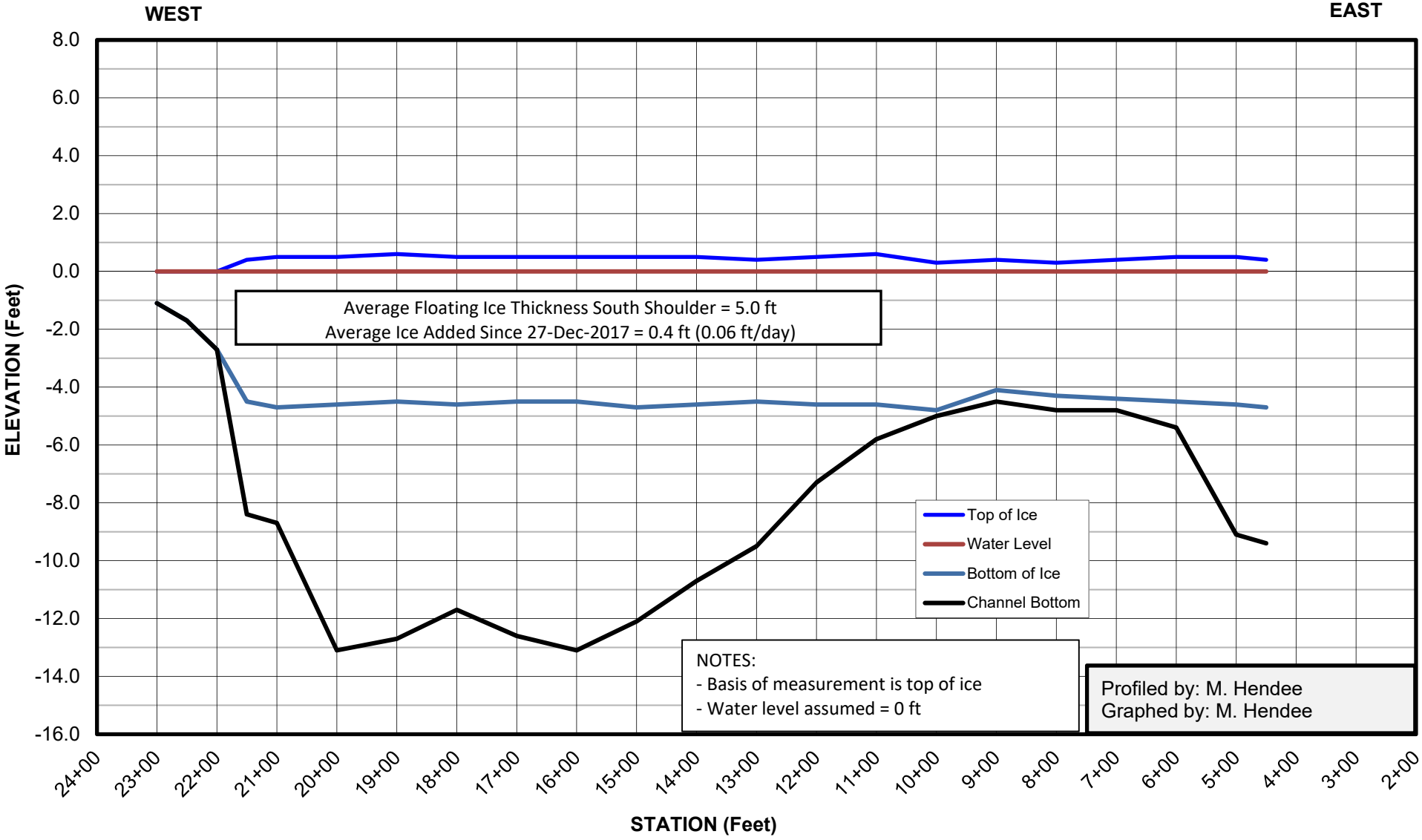
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
27 Dec 2017



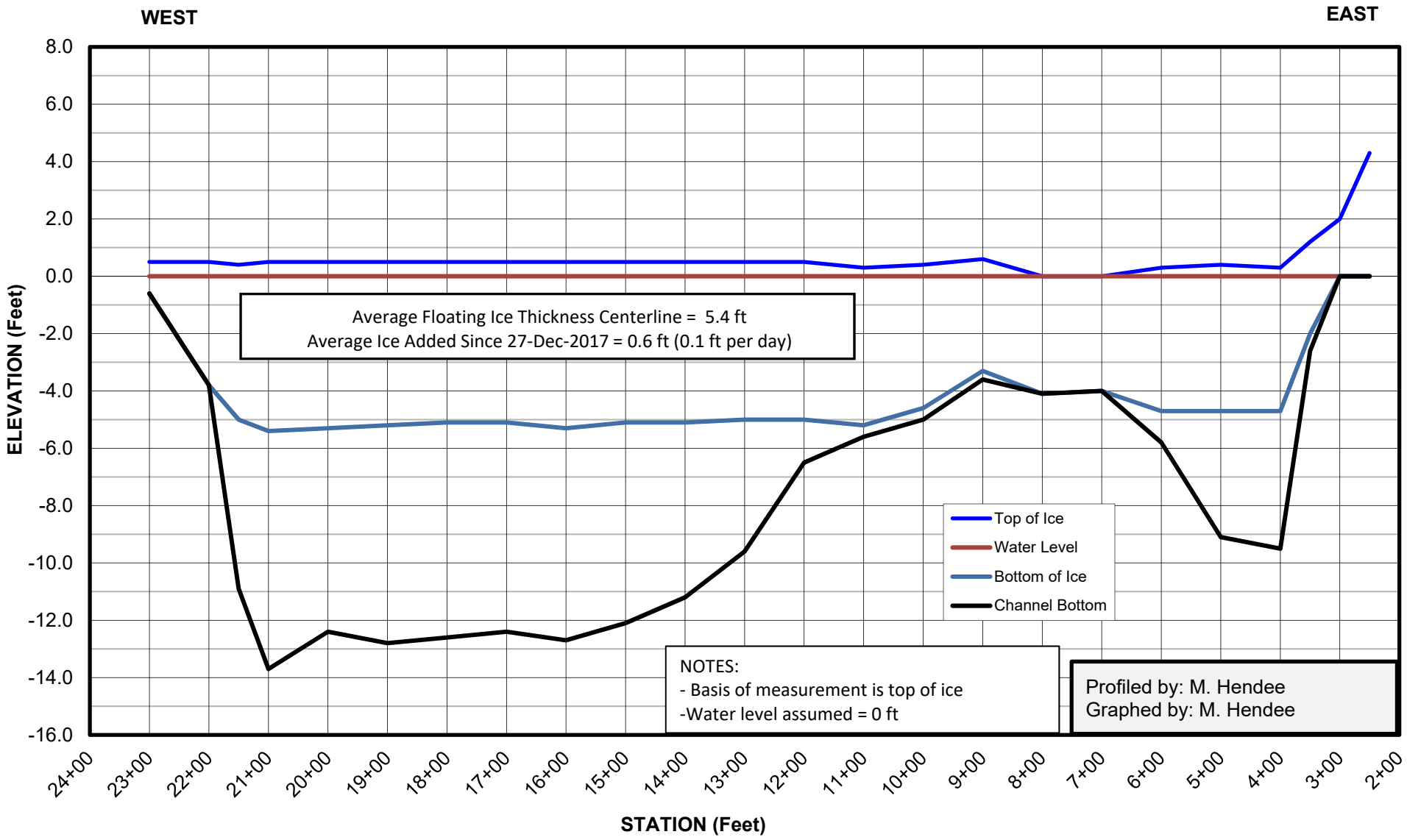
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
27 Dec 2017



MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
03-Jan-2018



MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
03-Jan-2018



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ICE ROAD CROSSING
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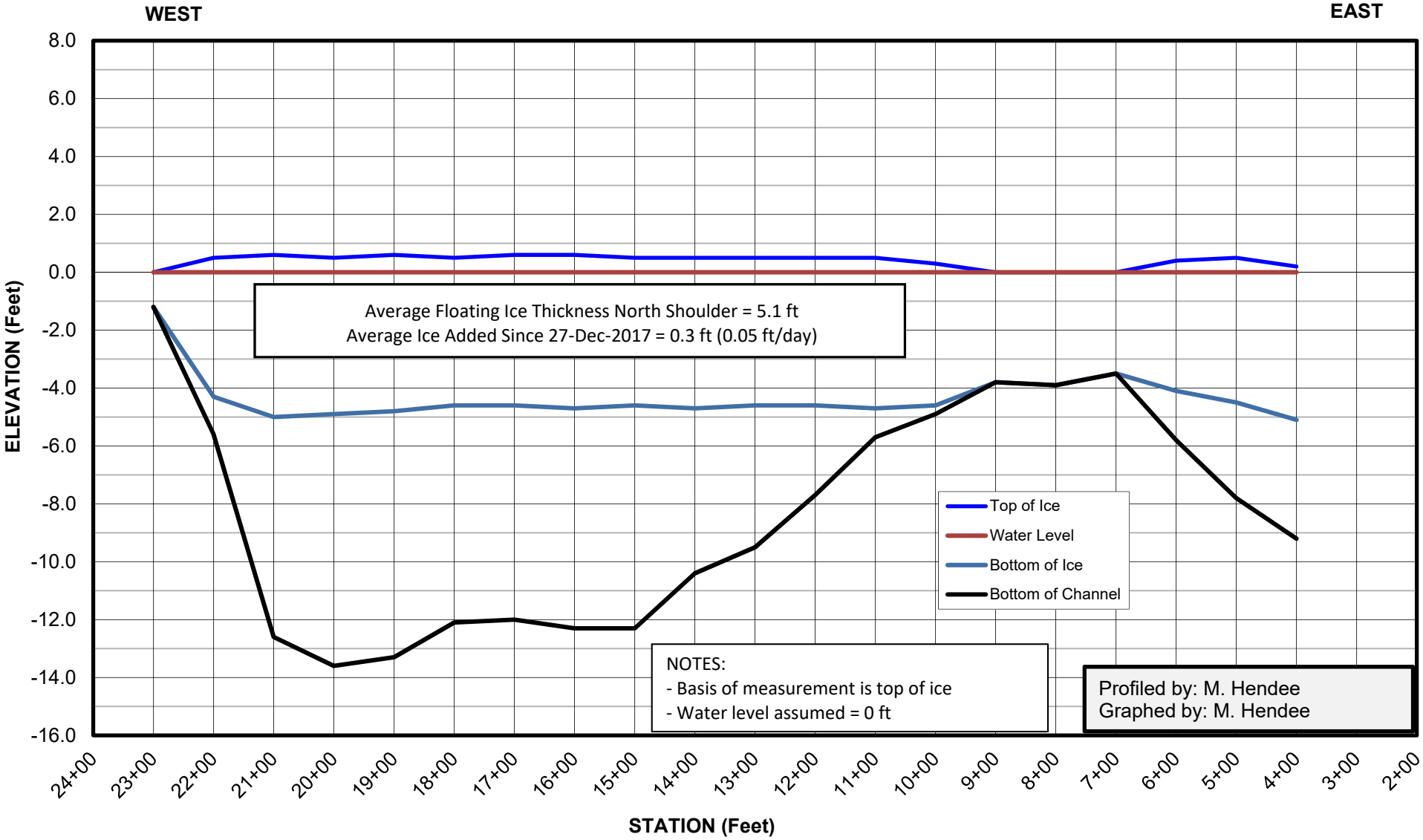
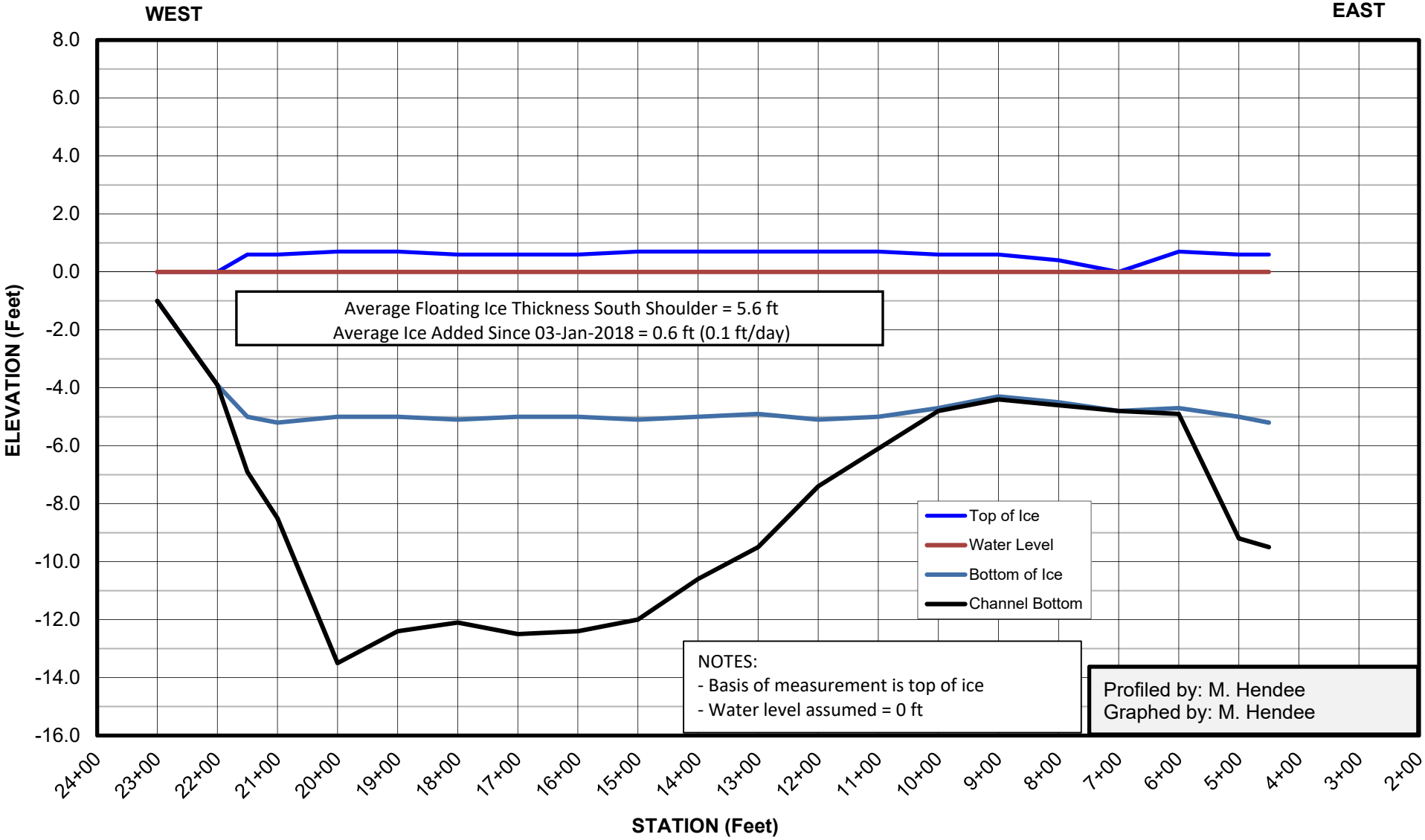
03-Jan-2018



MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
10-Jan-2018



MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
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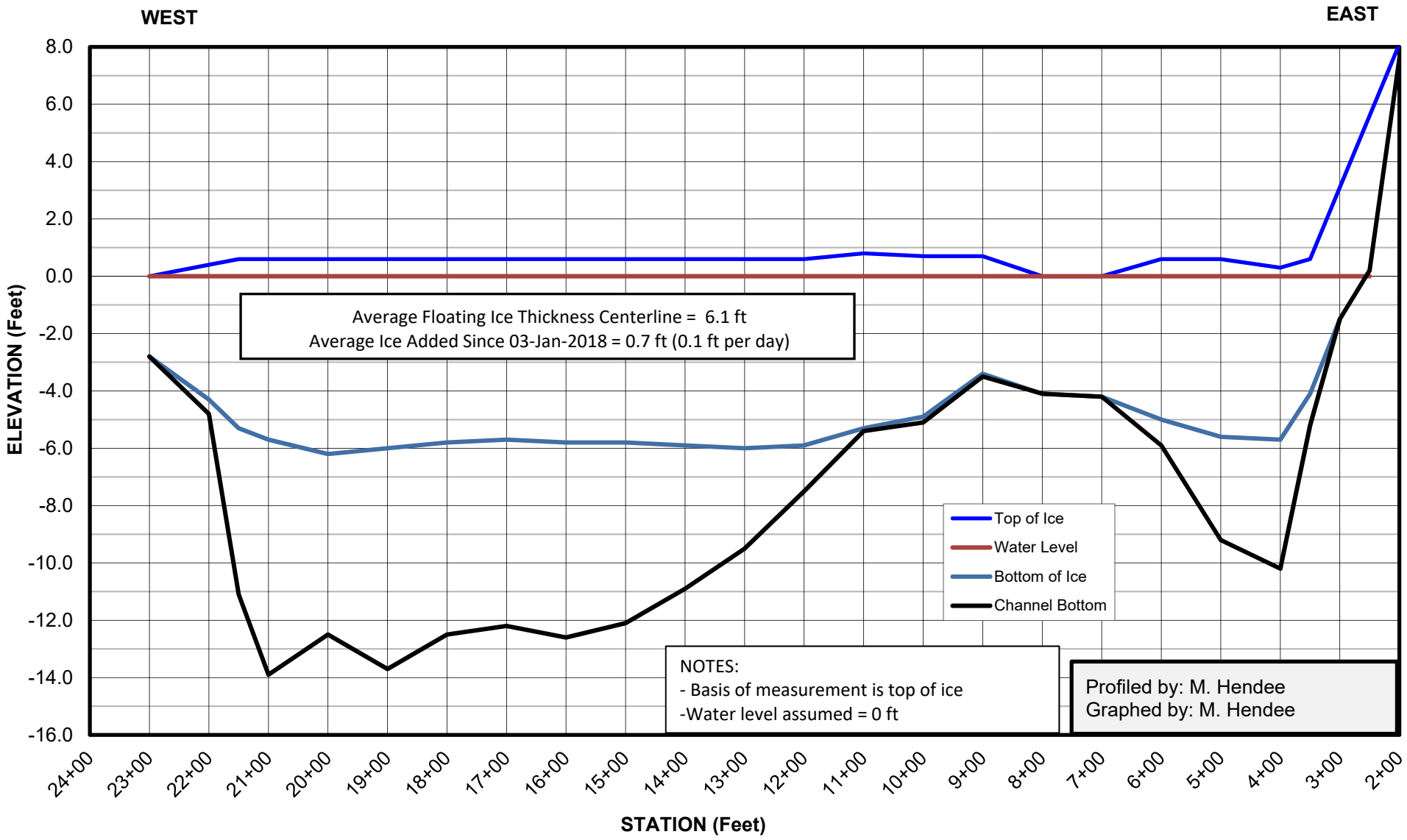
10-Jan-2018



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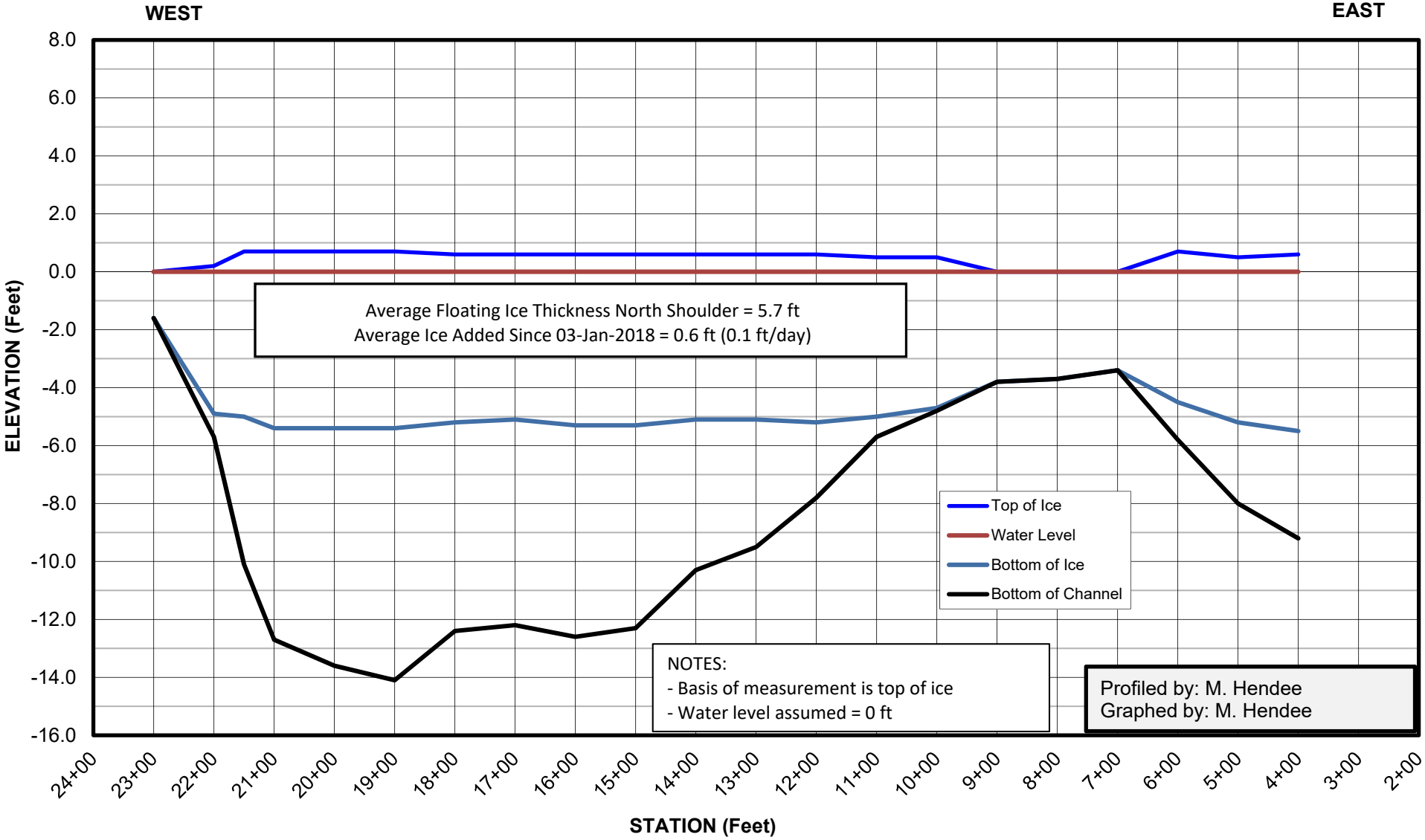
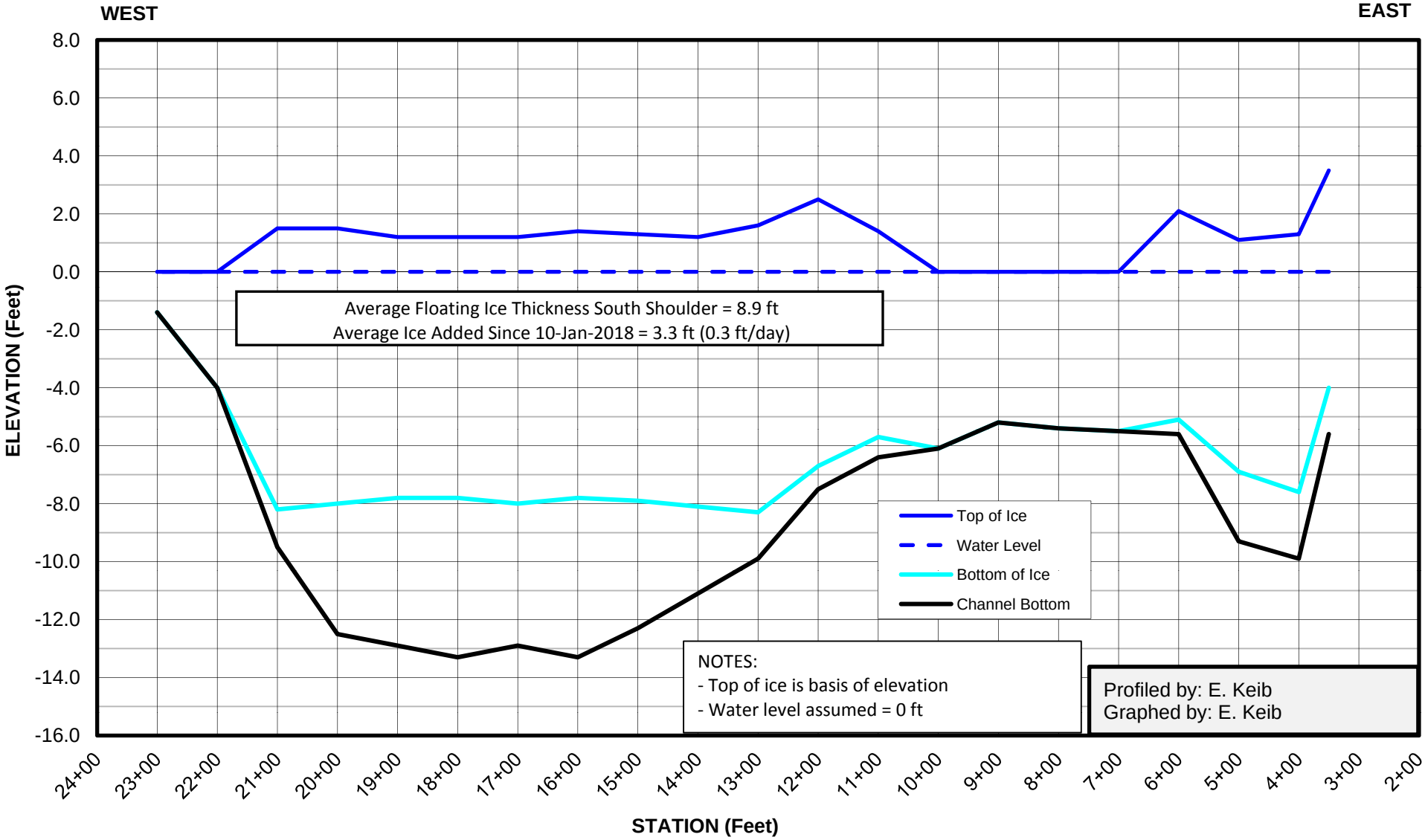
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
10-Jan-2018



MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
20-Jan-2018



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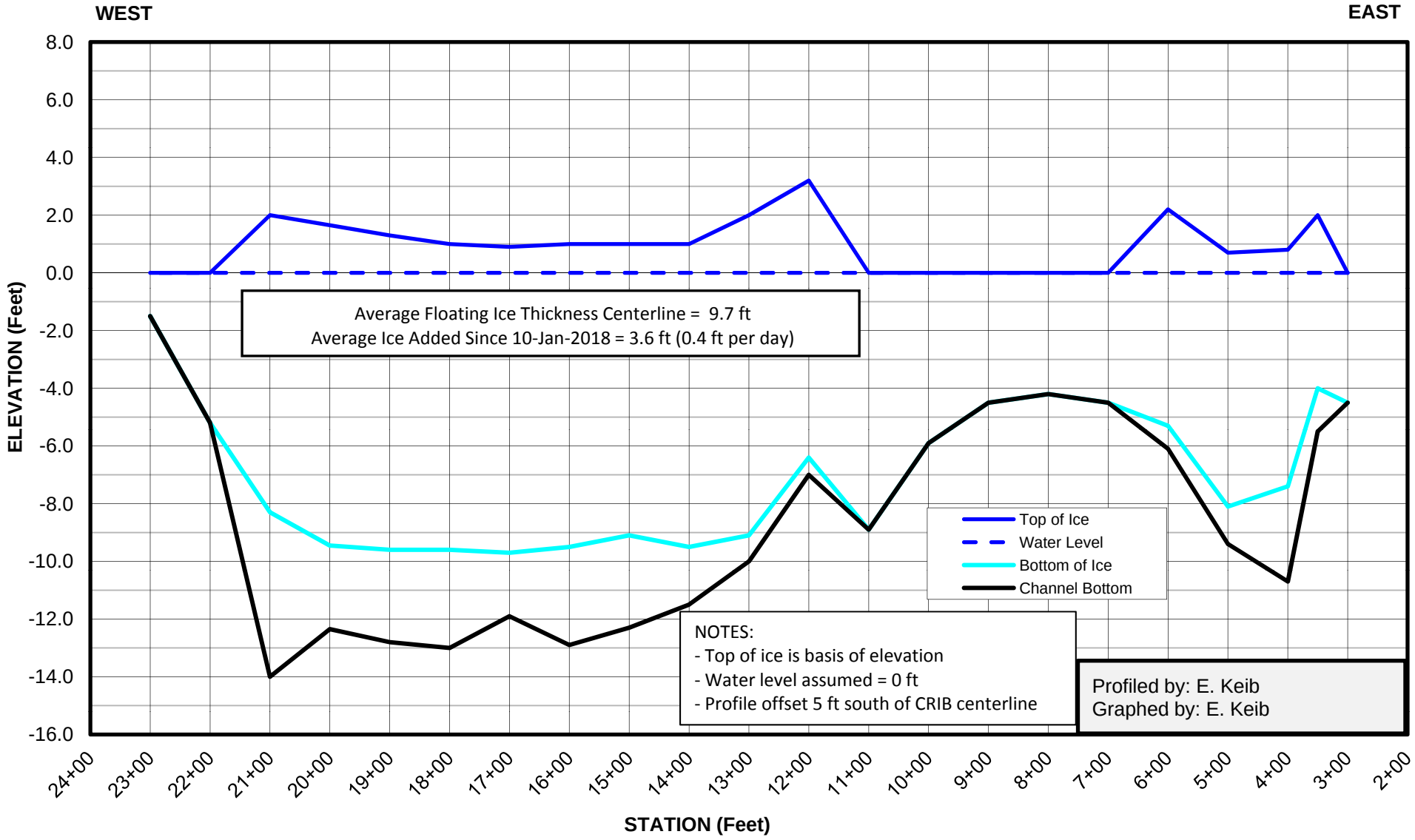
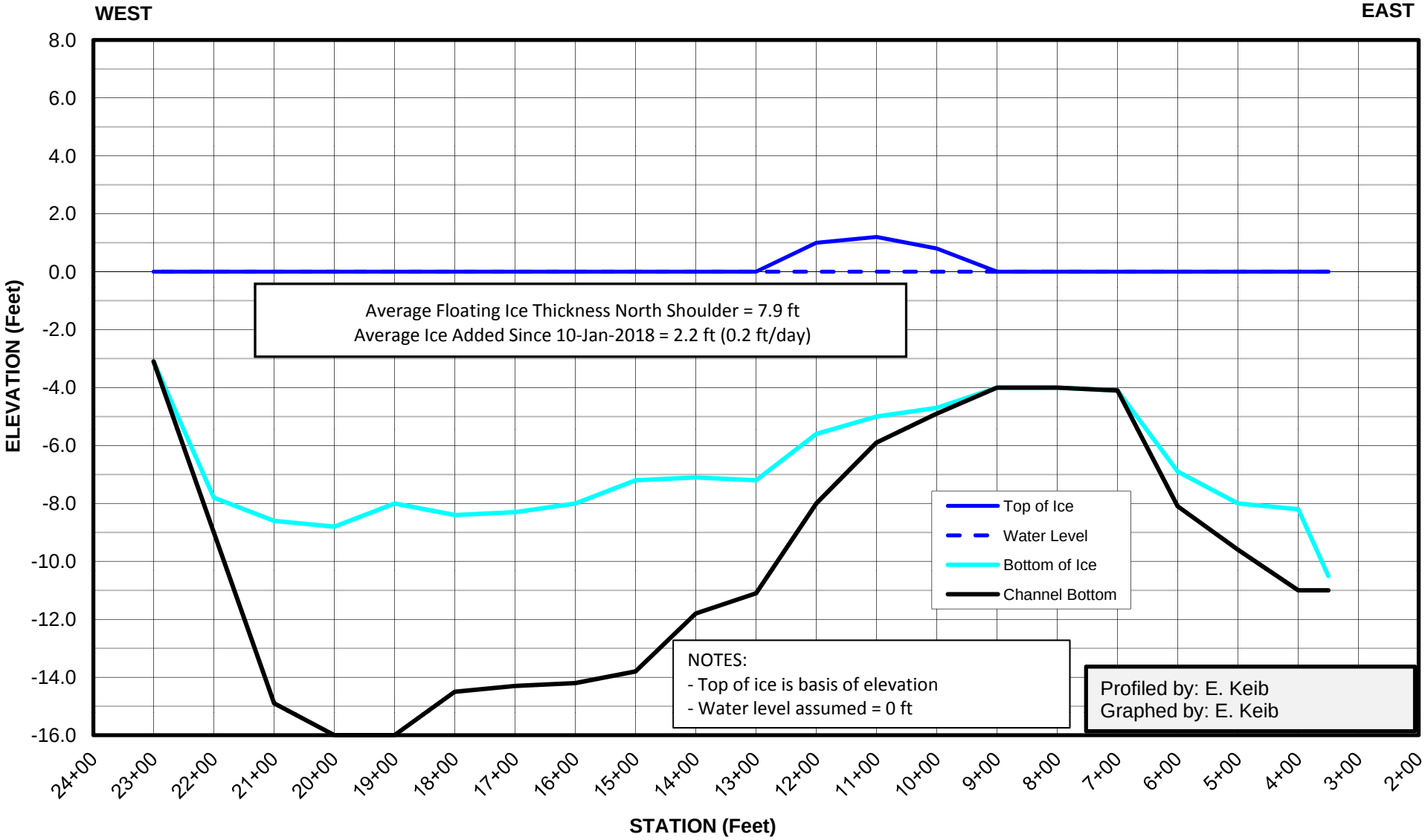
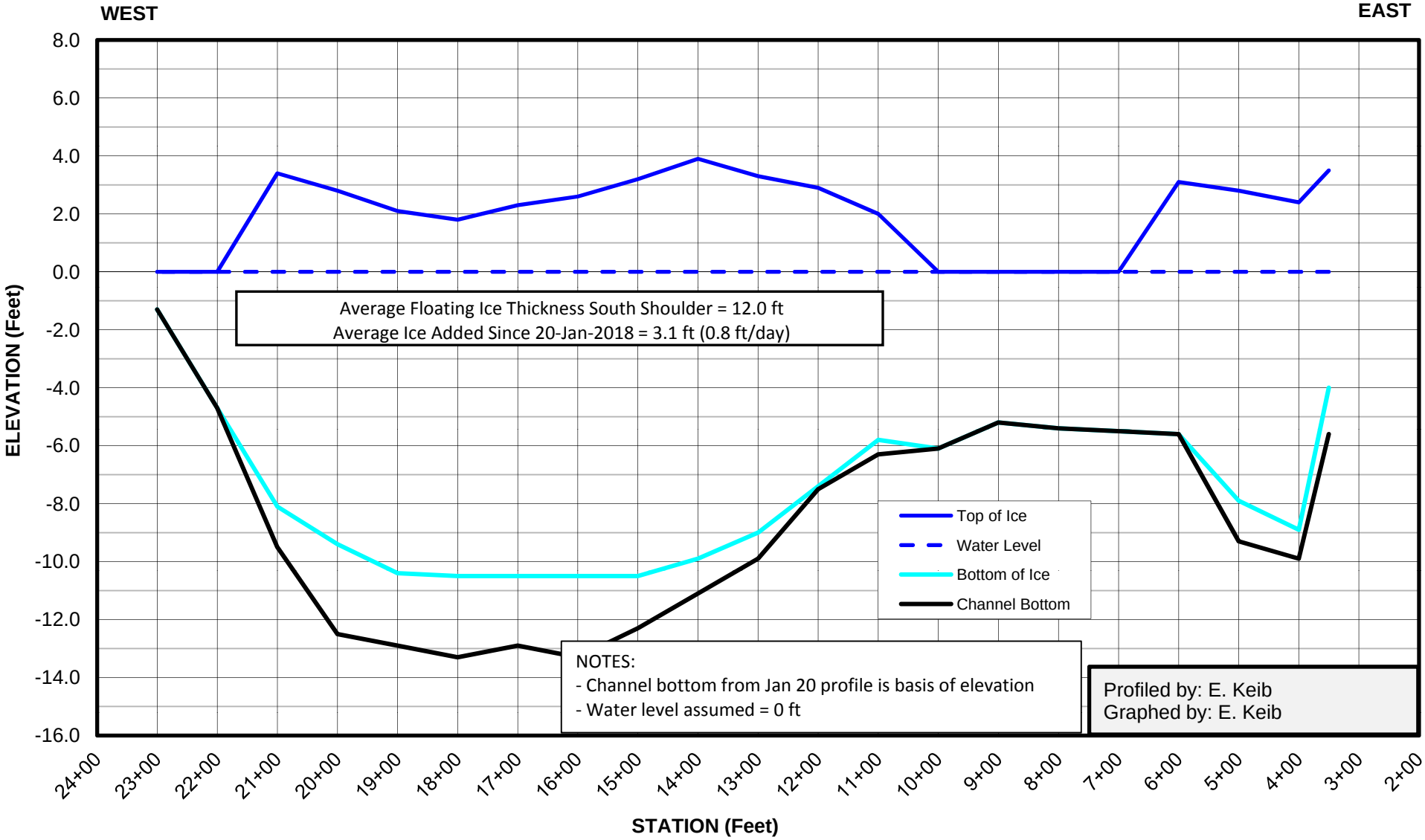
ICE ROAD CROSSING
CENTERLINE
20-Jan-2018



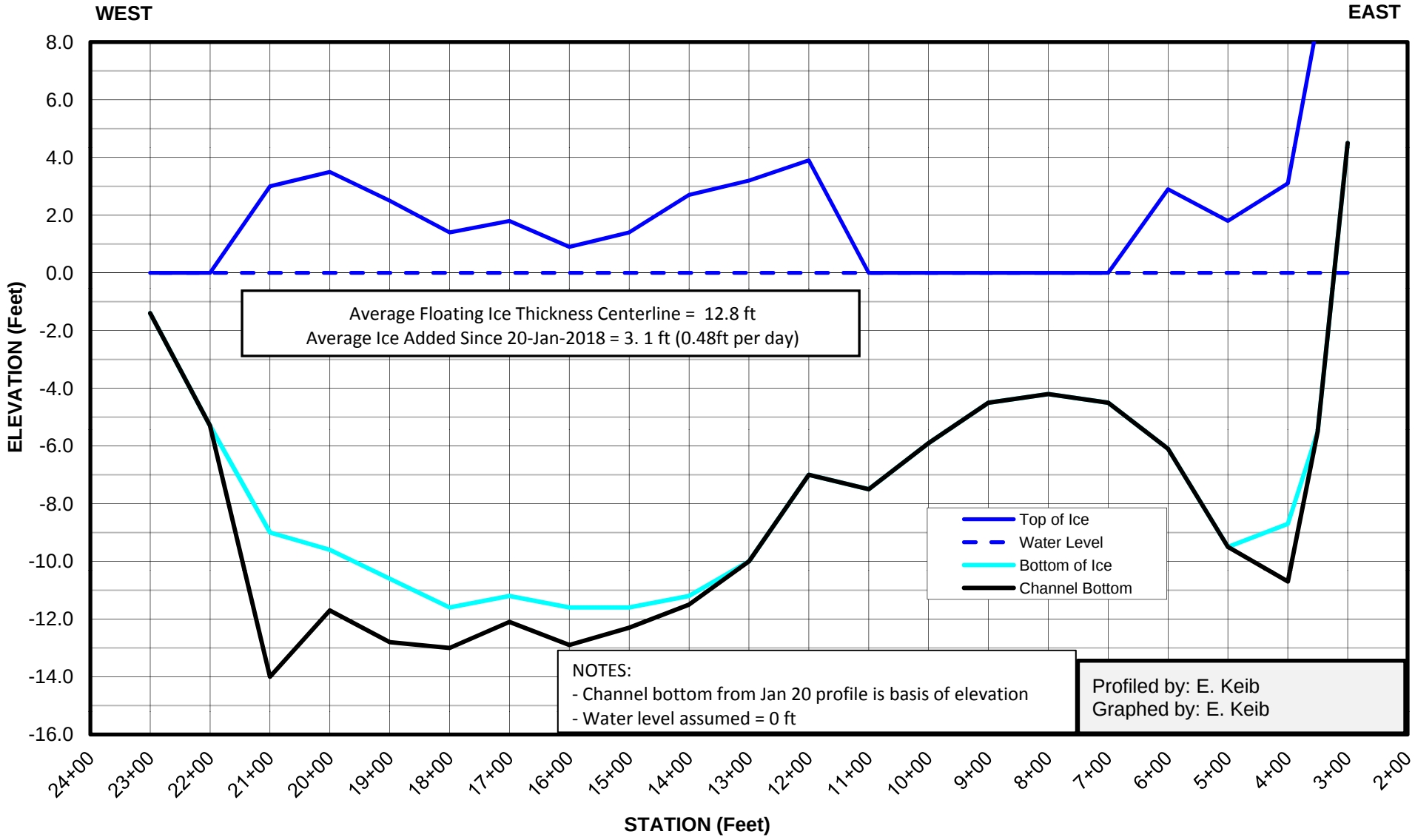
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
20-Jan-2018



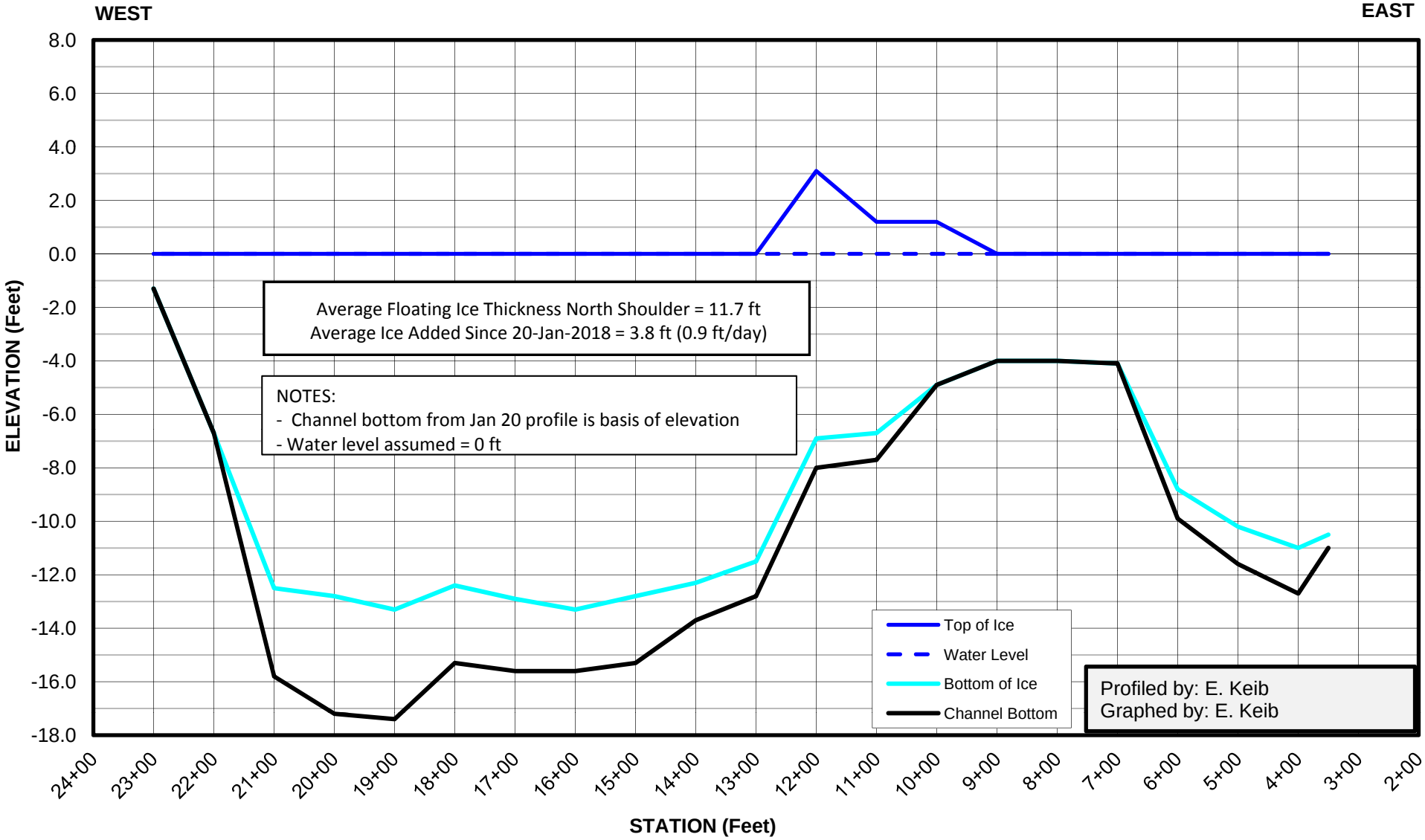
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
24-Jan-2018



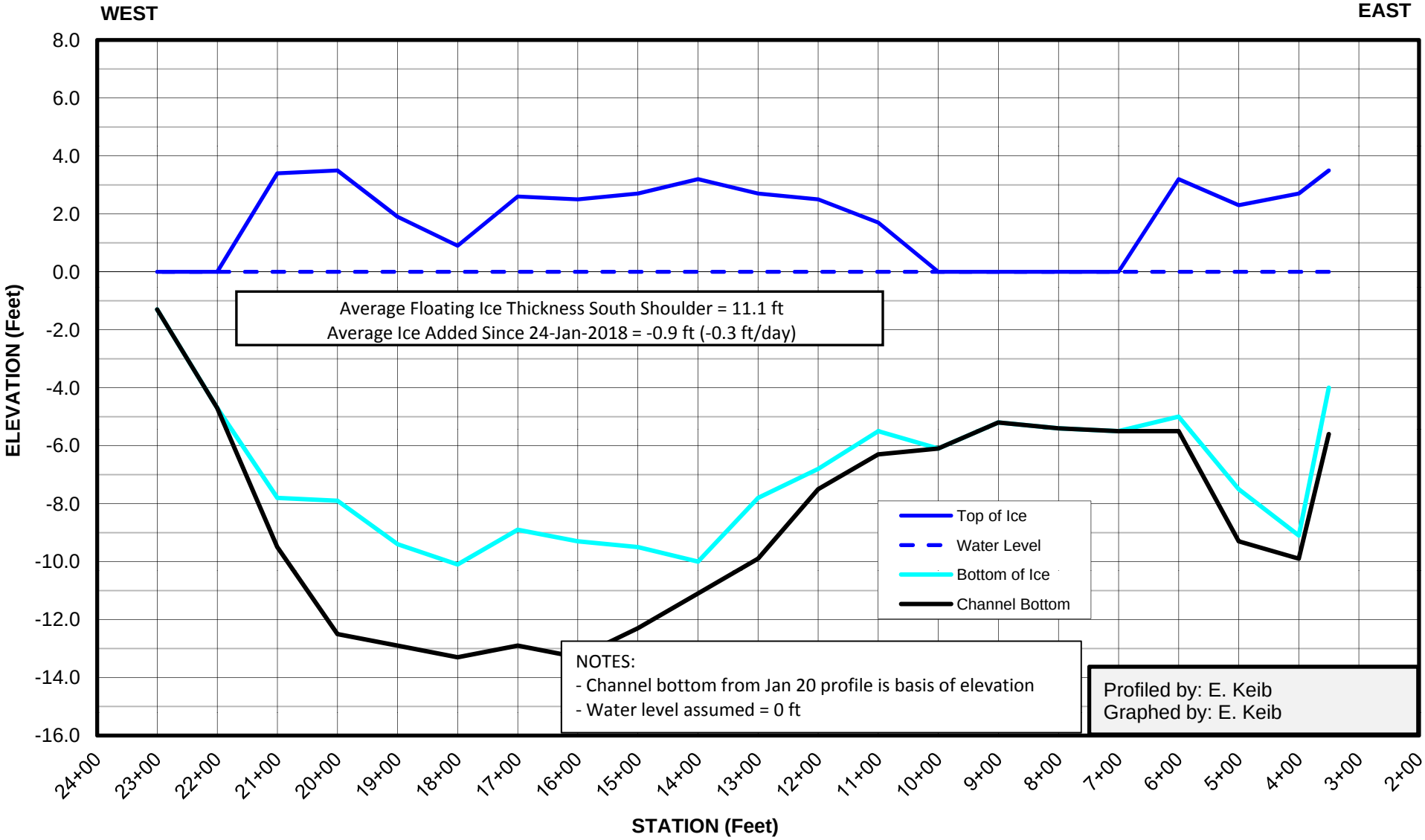
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
24-Jan-2018



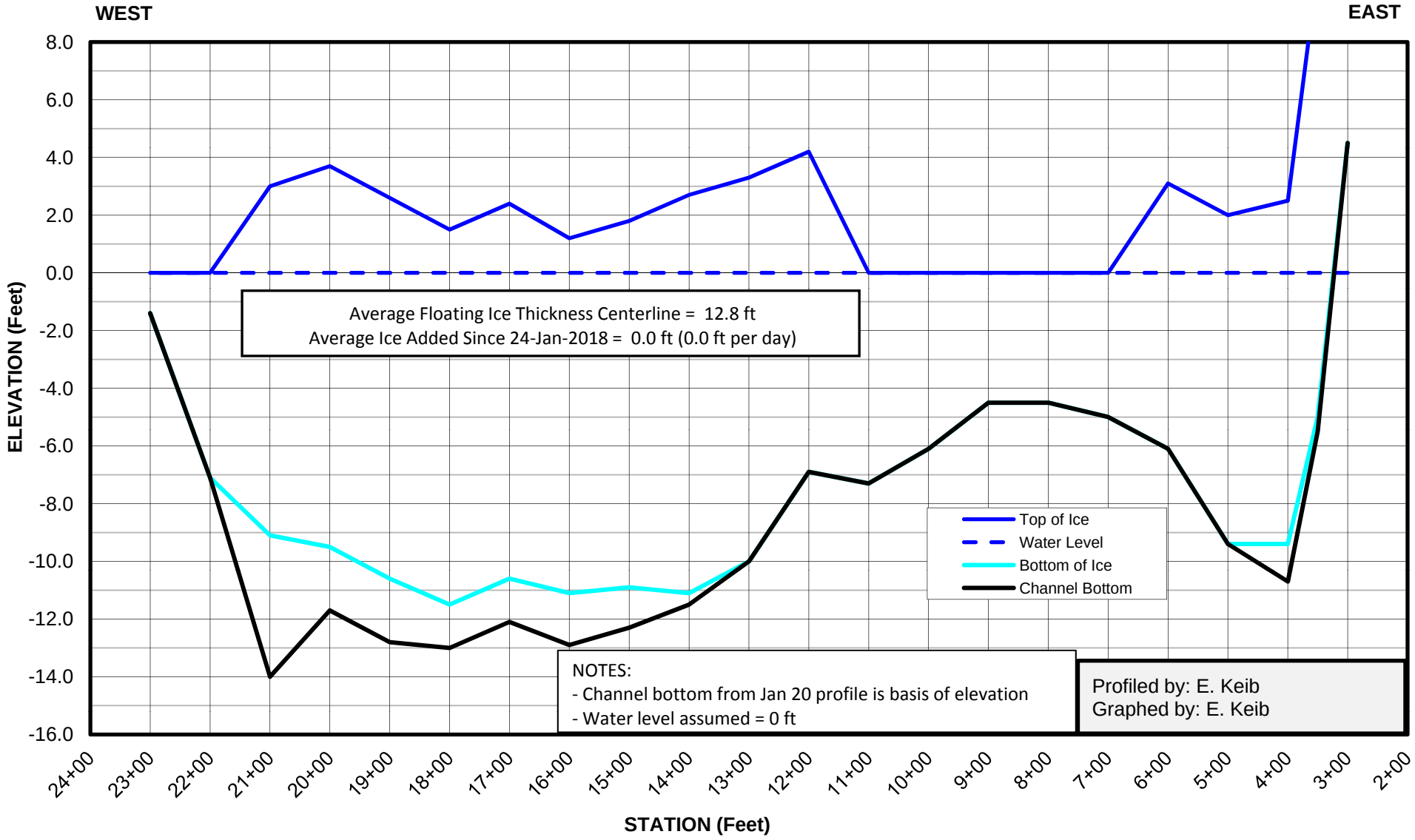
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
24-Jan-2018



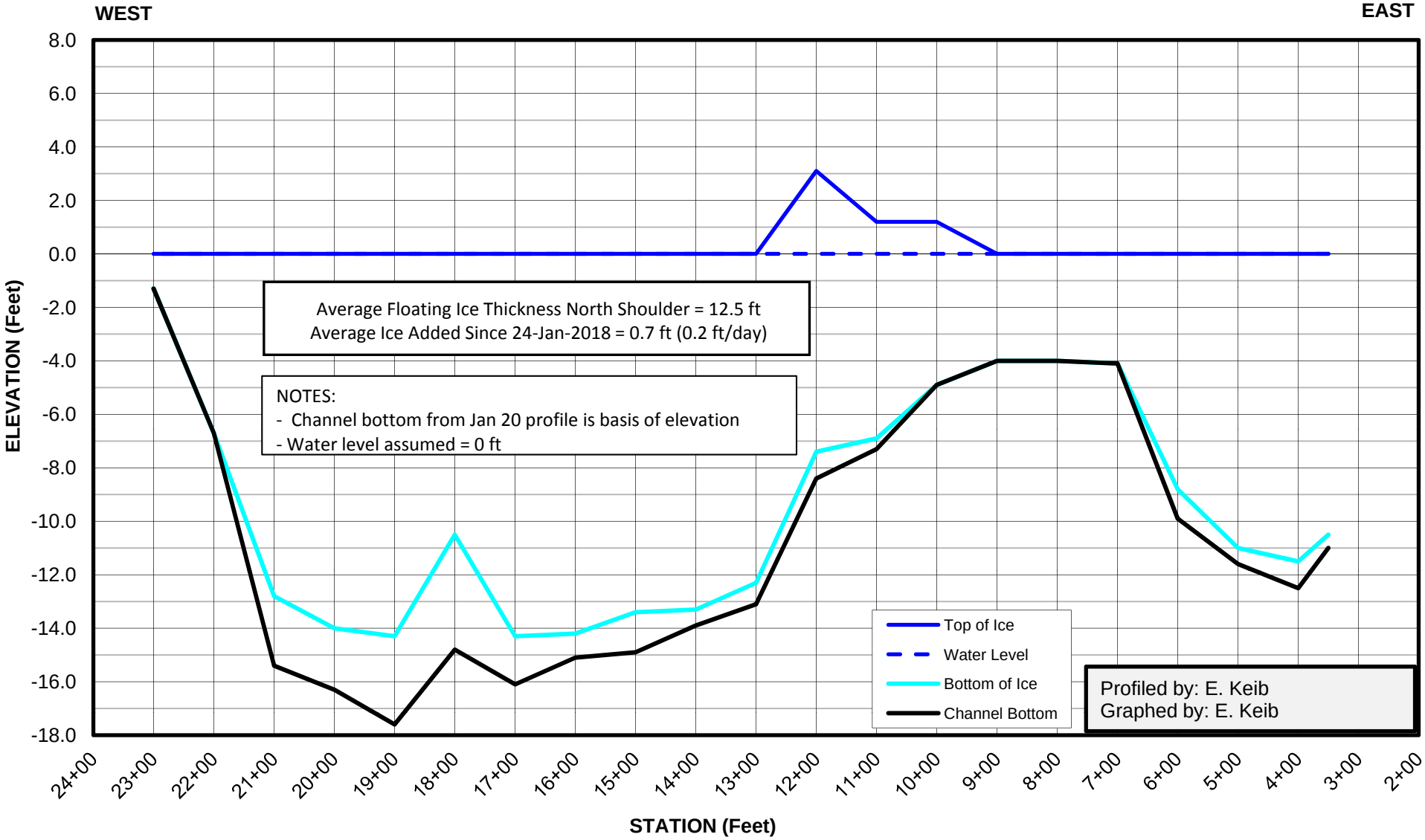
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
27-Jan-2018



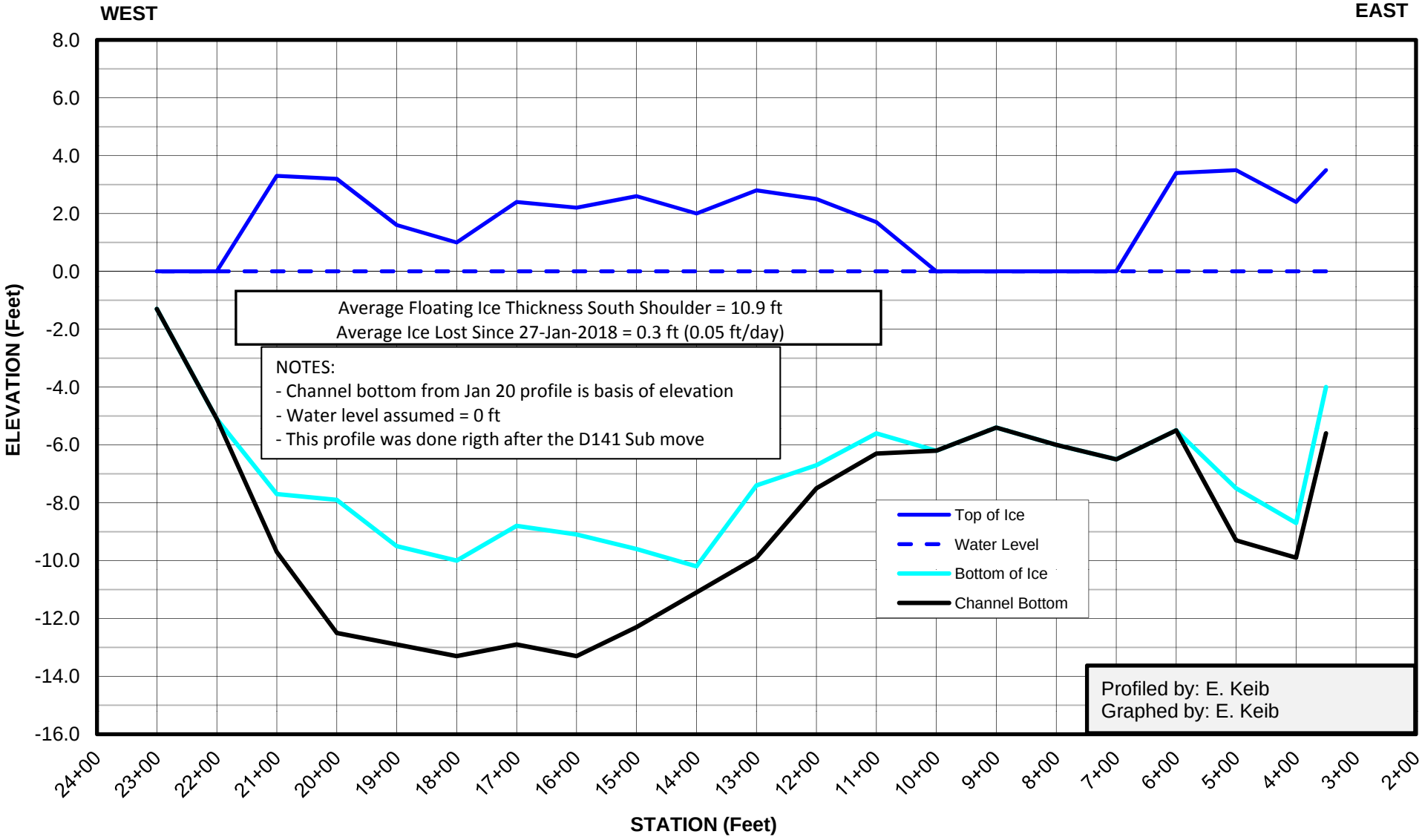
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
27-Jan-2018



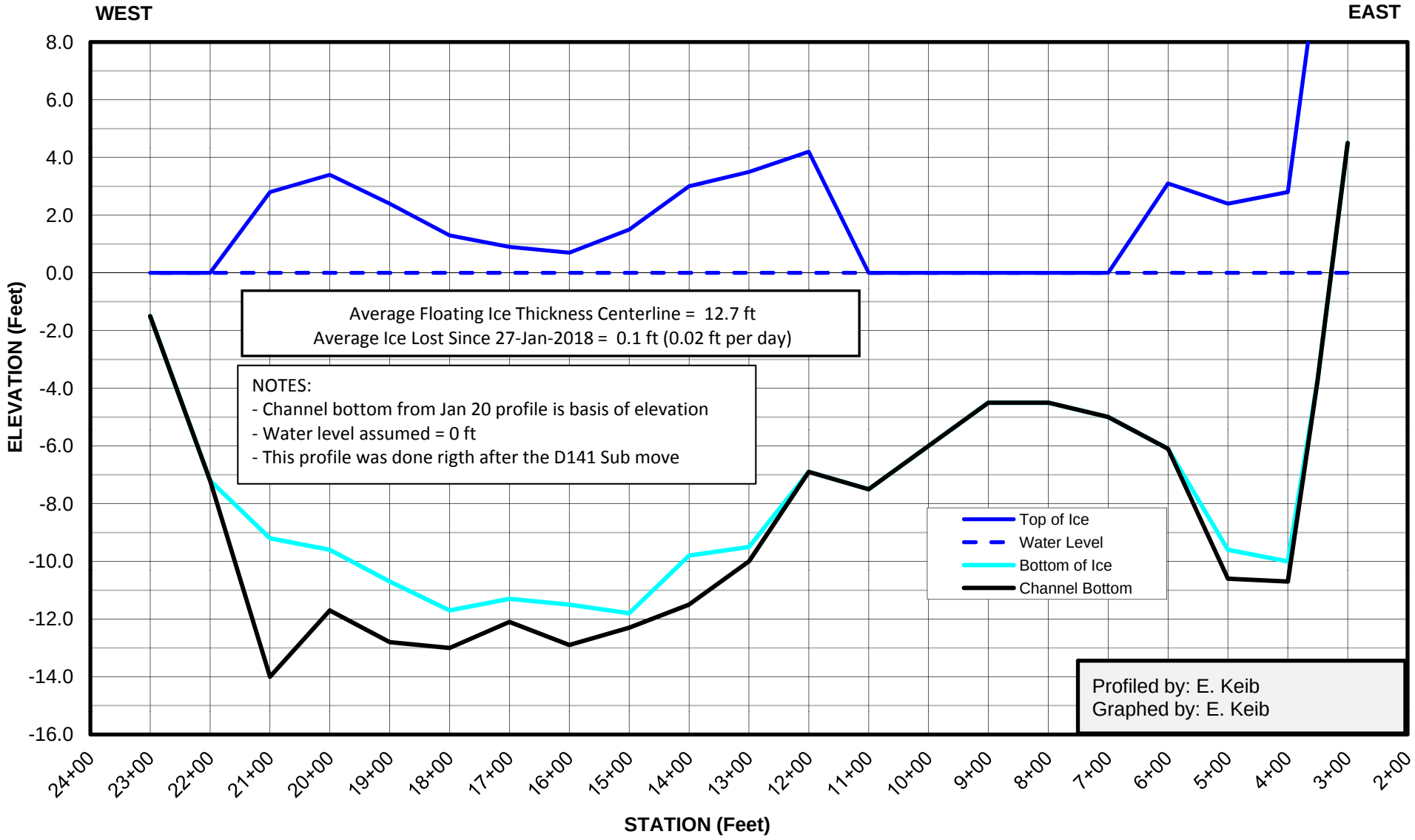
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
27-Jan-2018



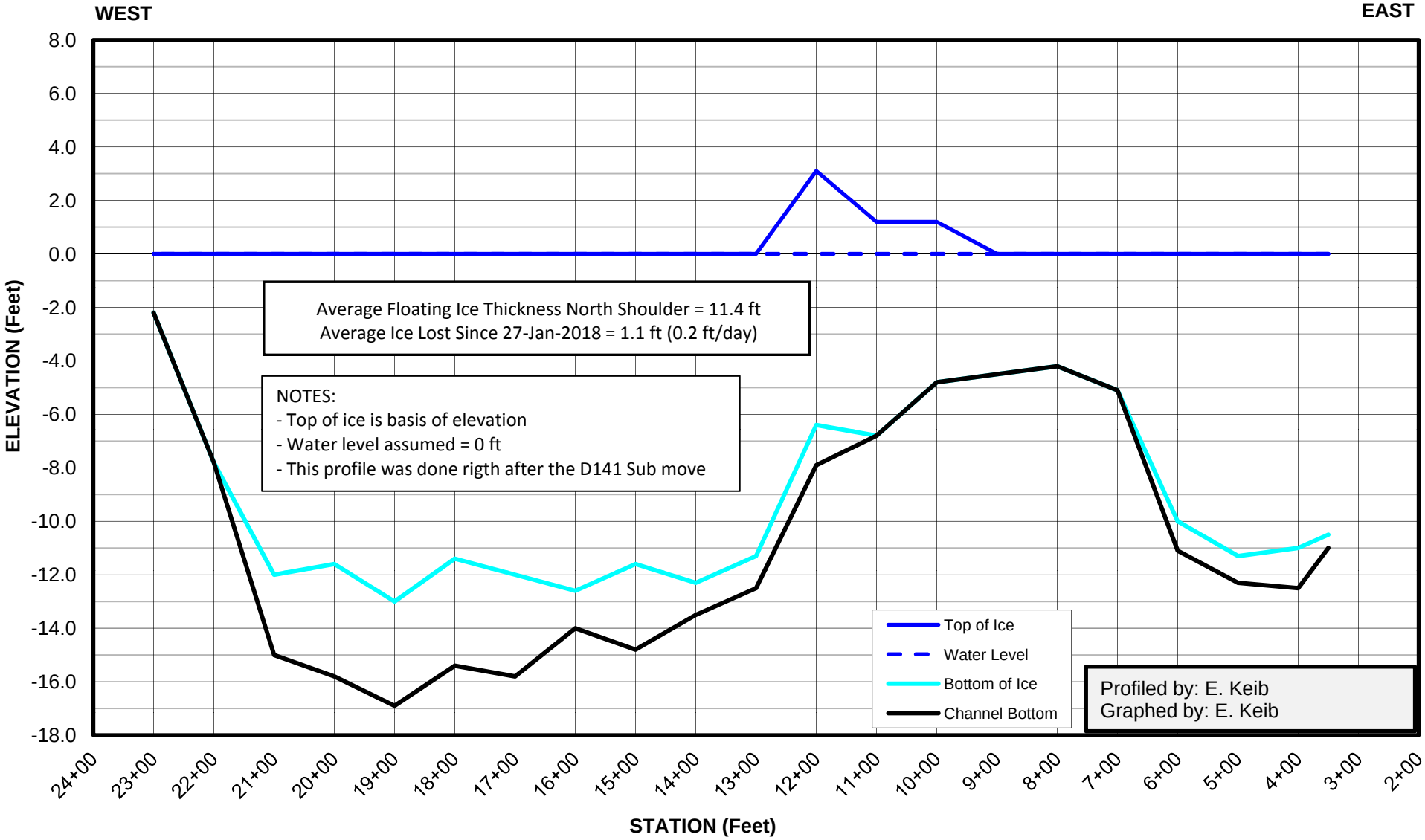
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
2-Feb-2018



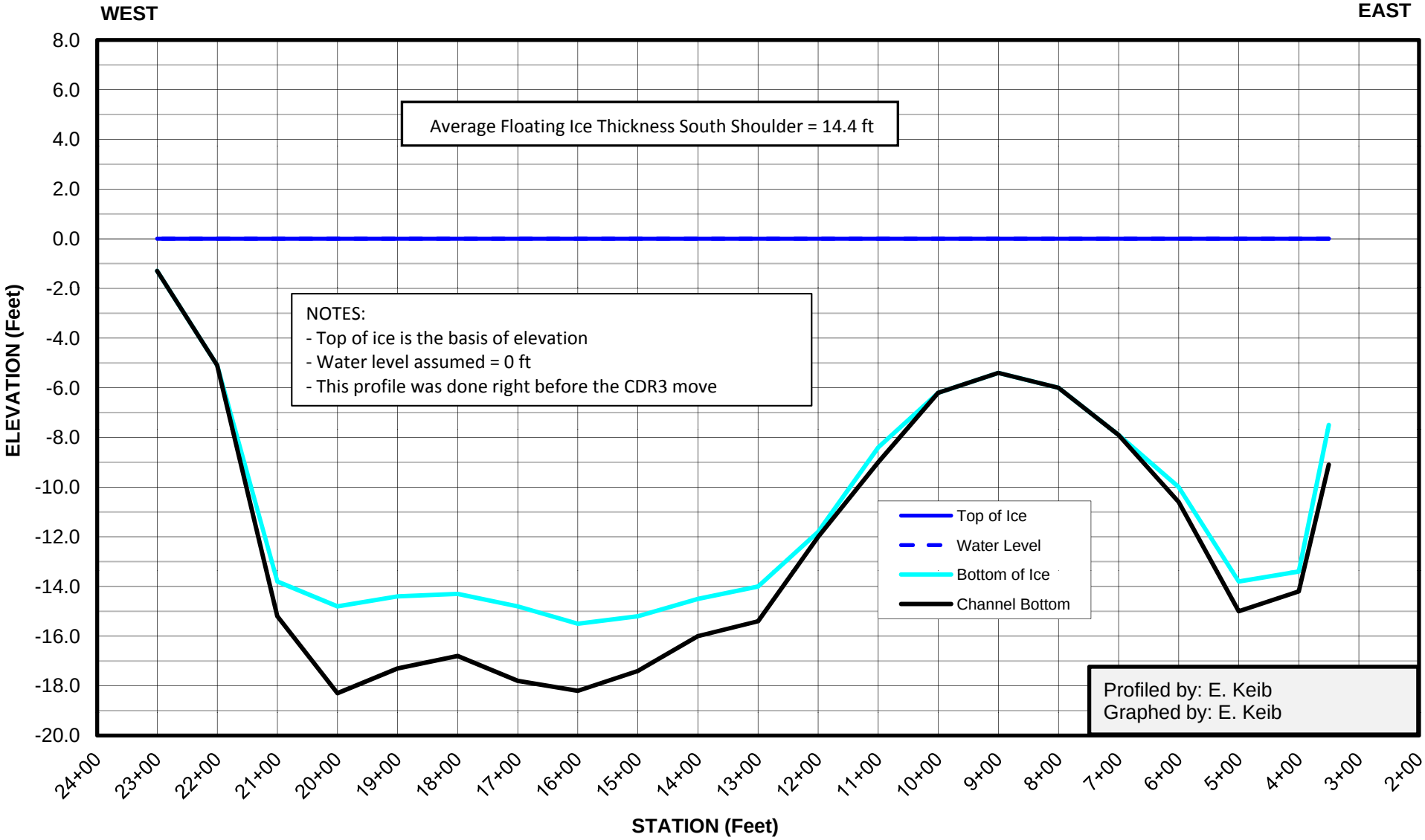
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
2-Feb-2018



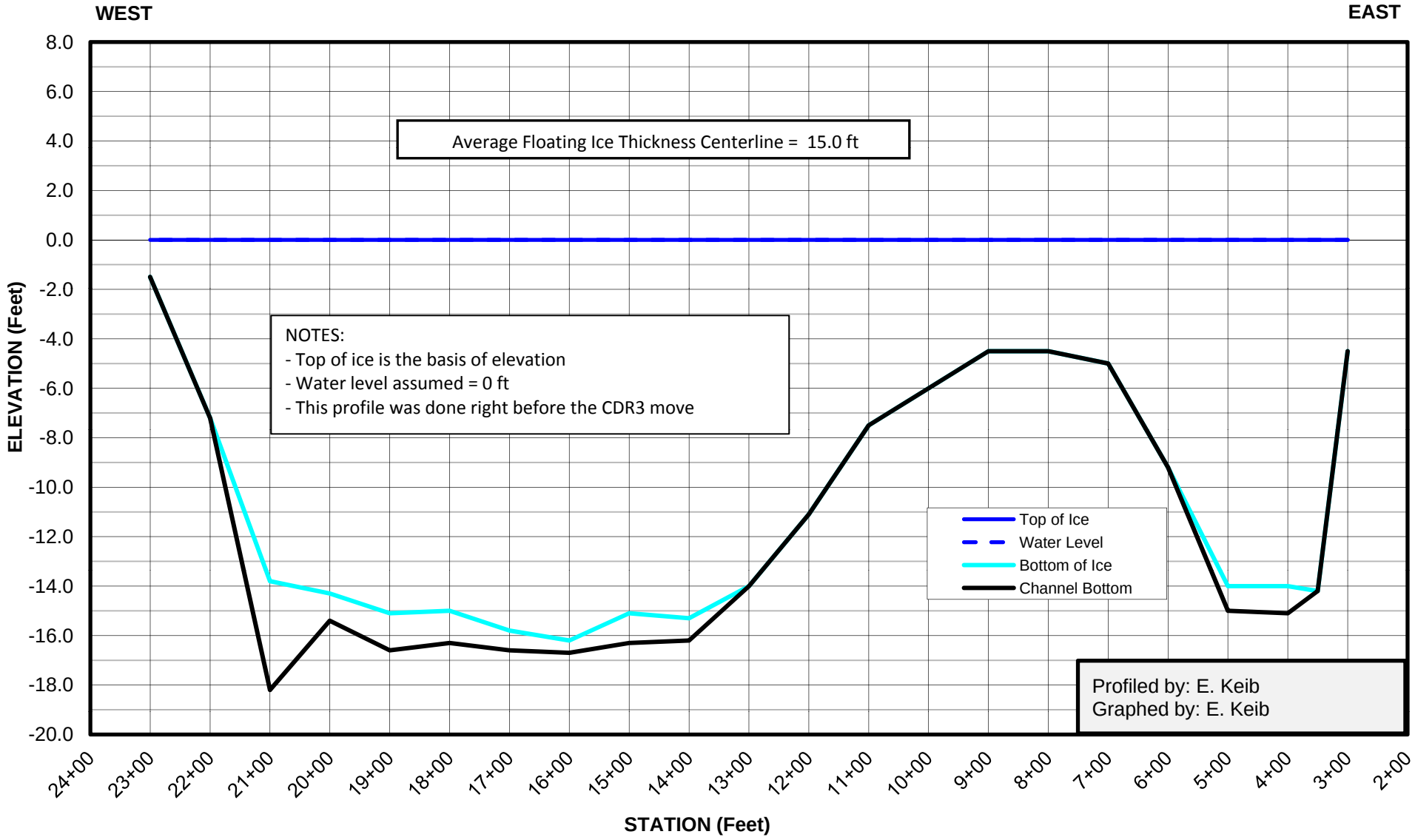
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
2-Feb-2018



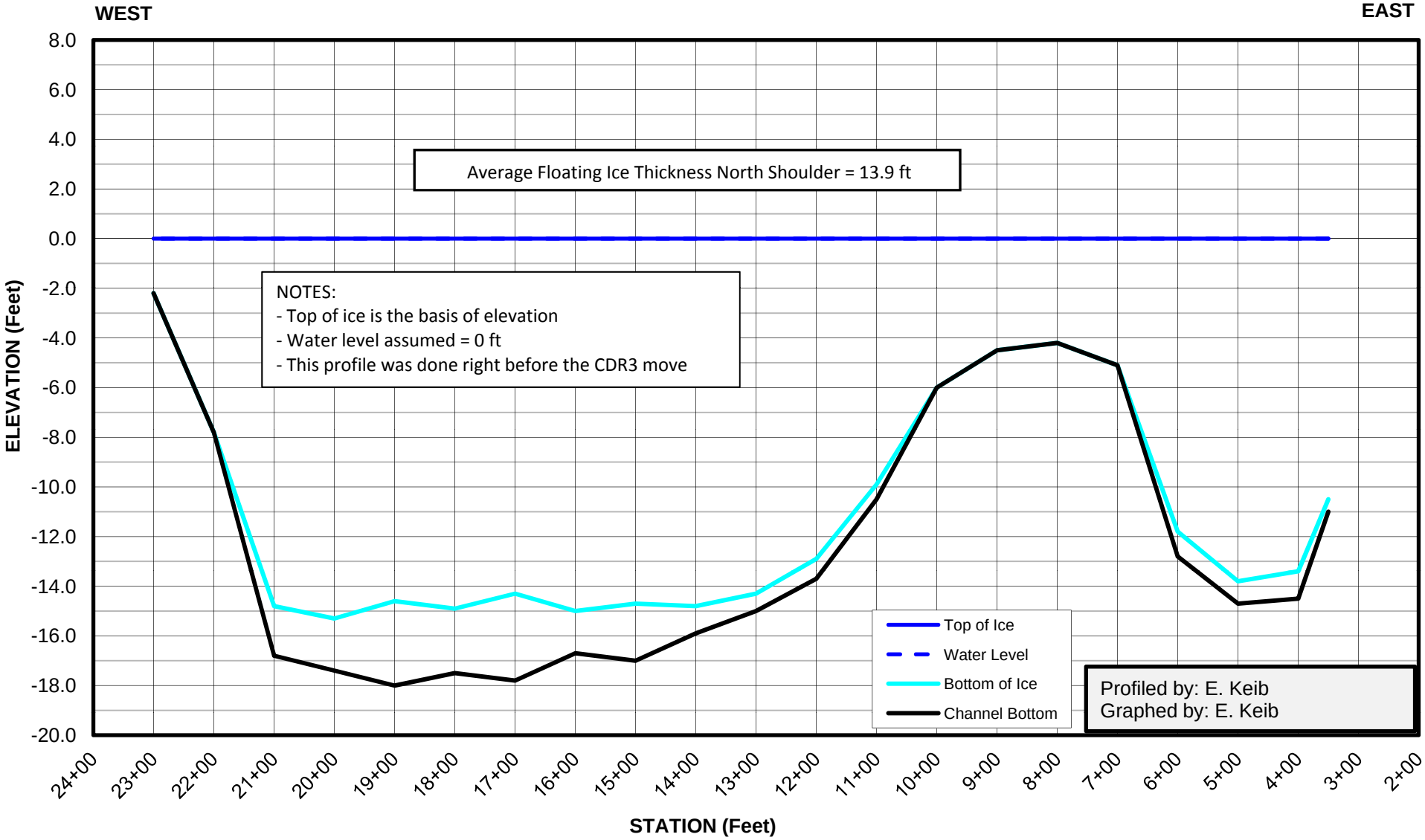
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
4-Feb-2018



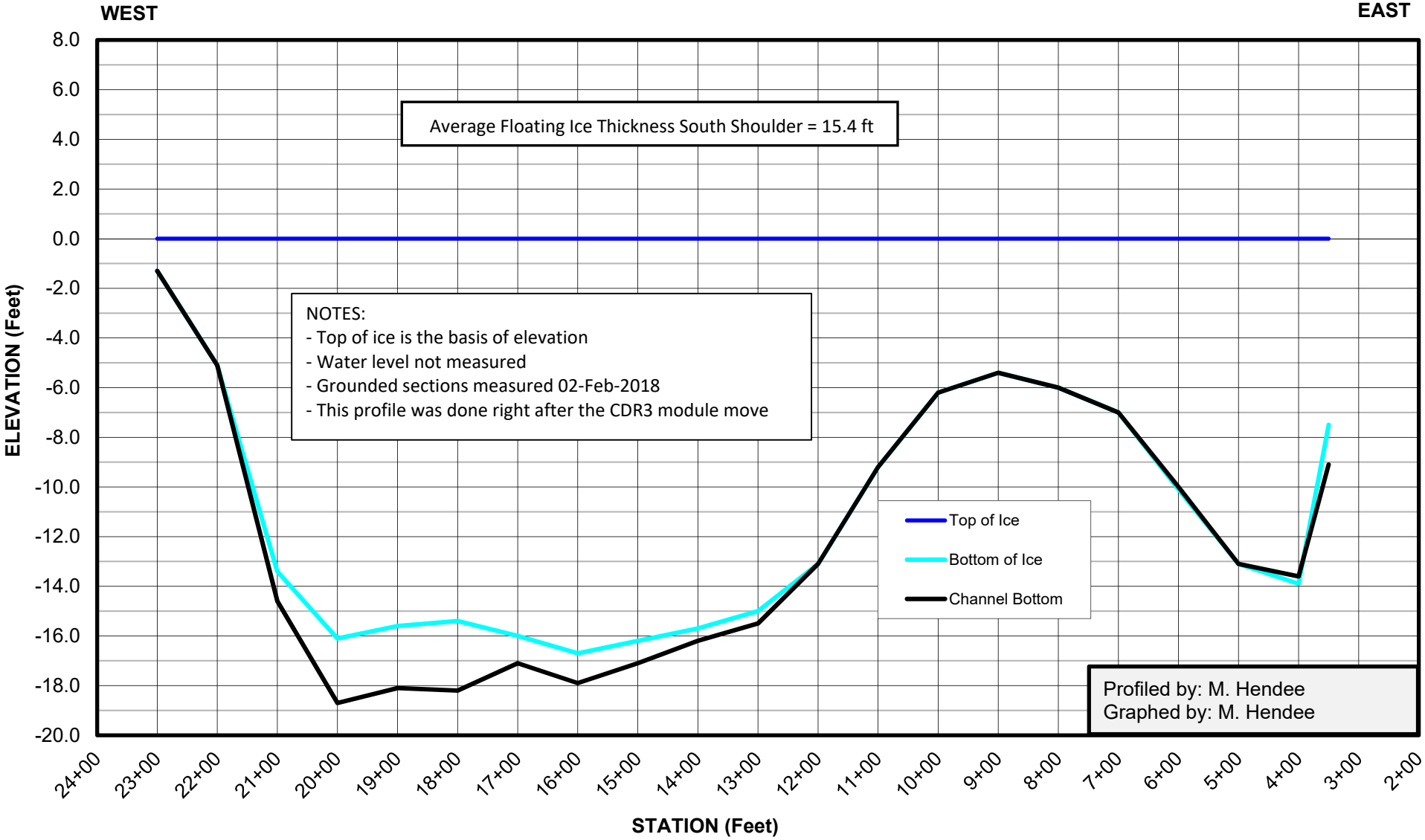
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
4-Feb-2018



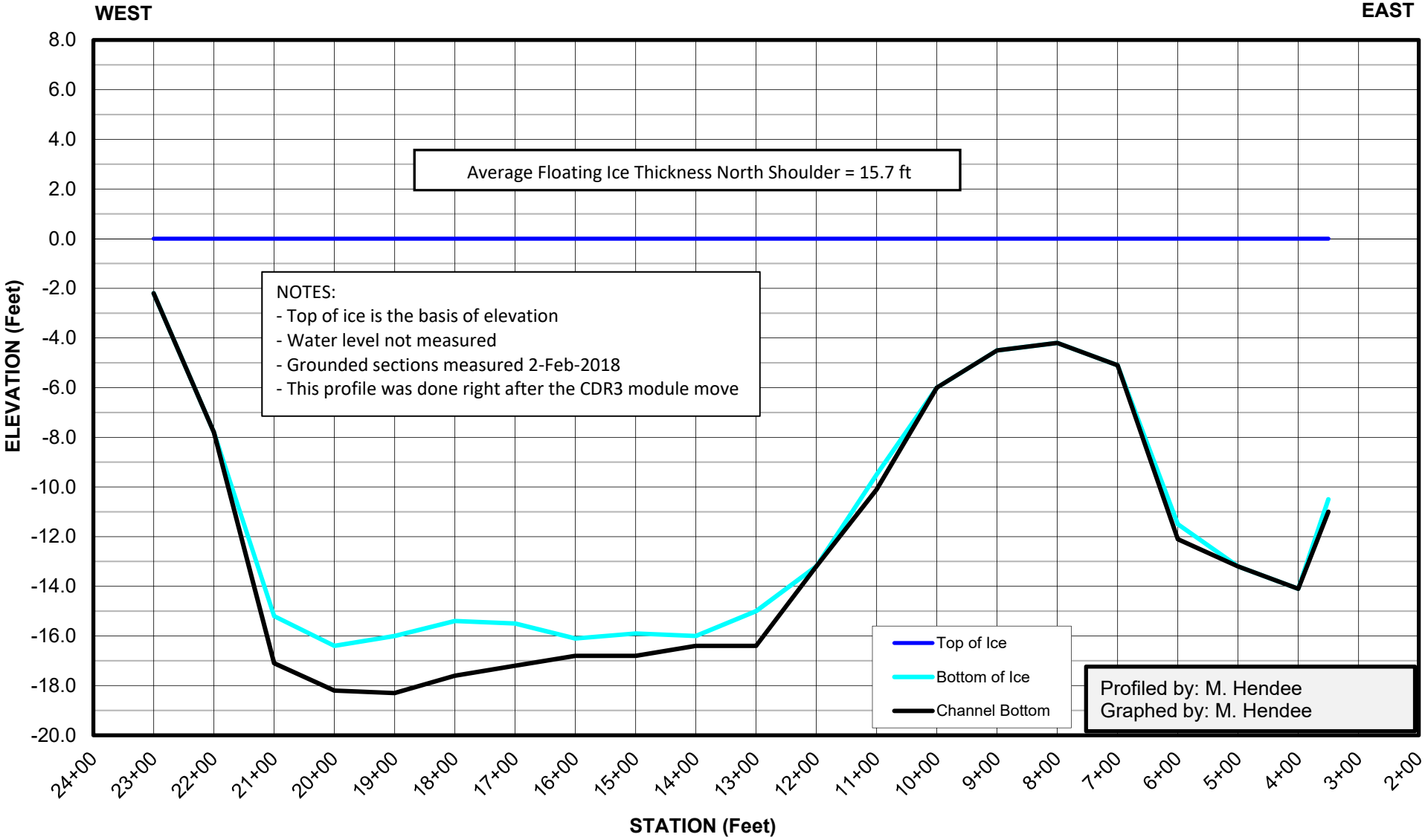
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
4-Feb-2018



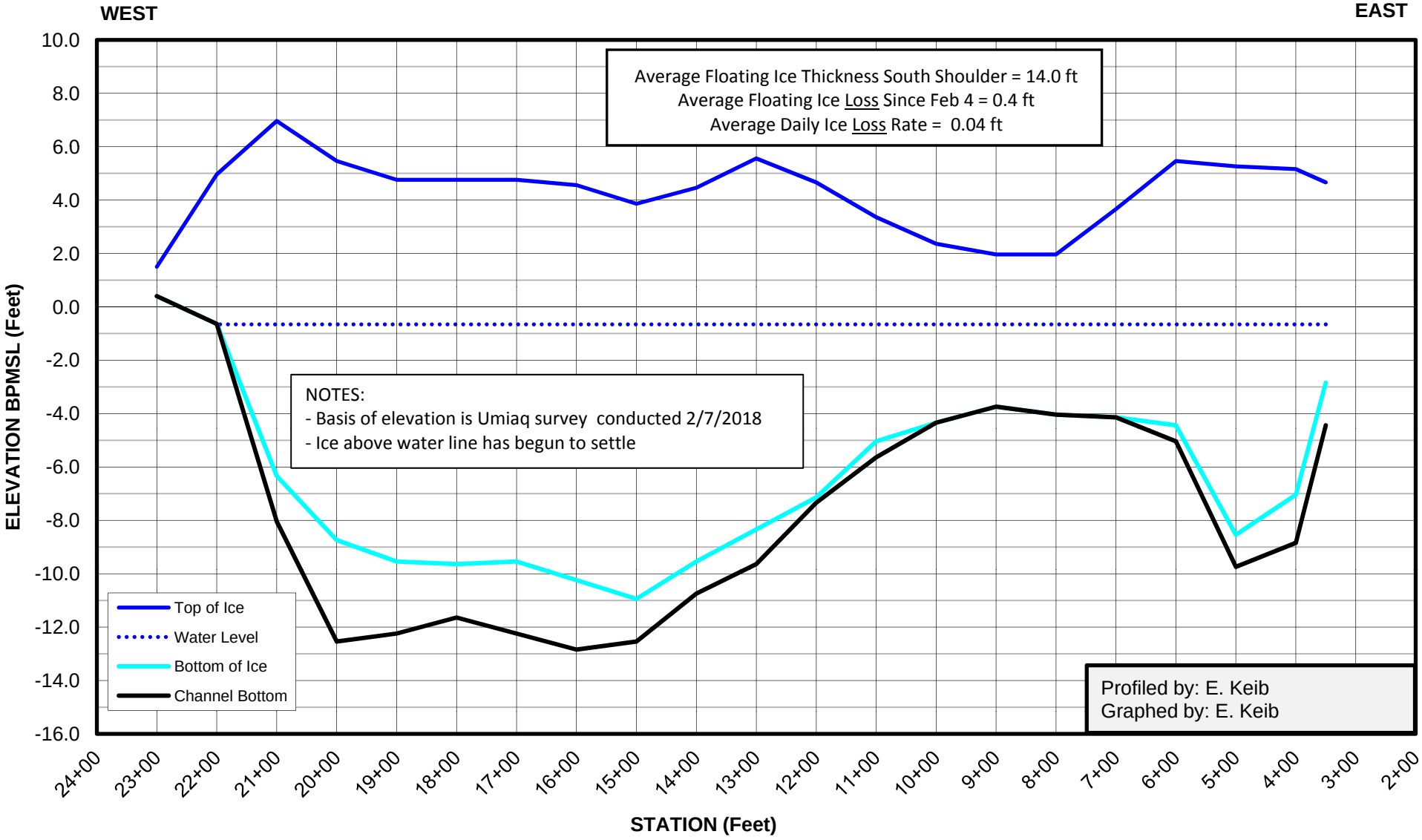
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
60' South of Centerline
6-Feb-2018



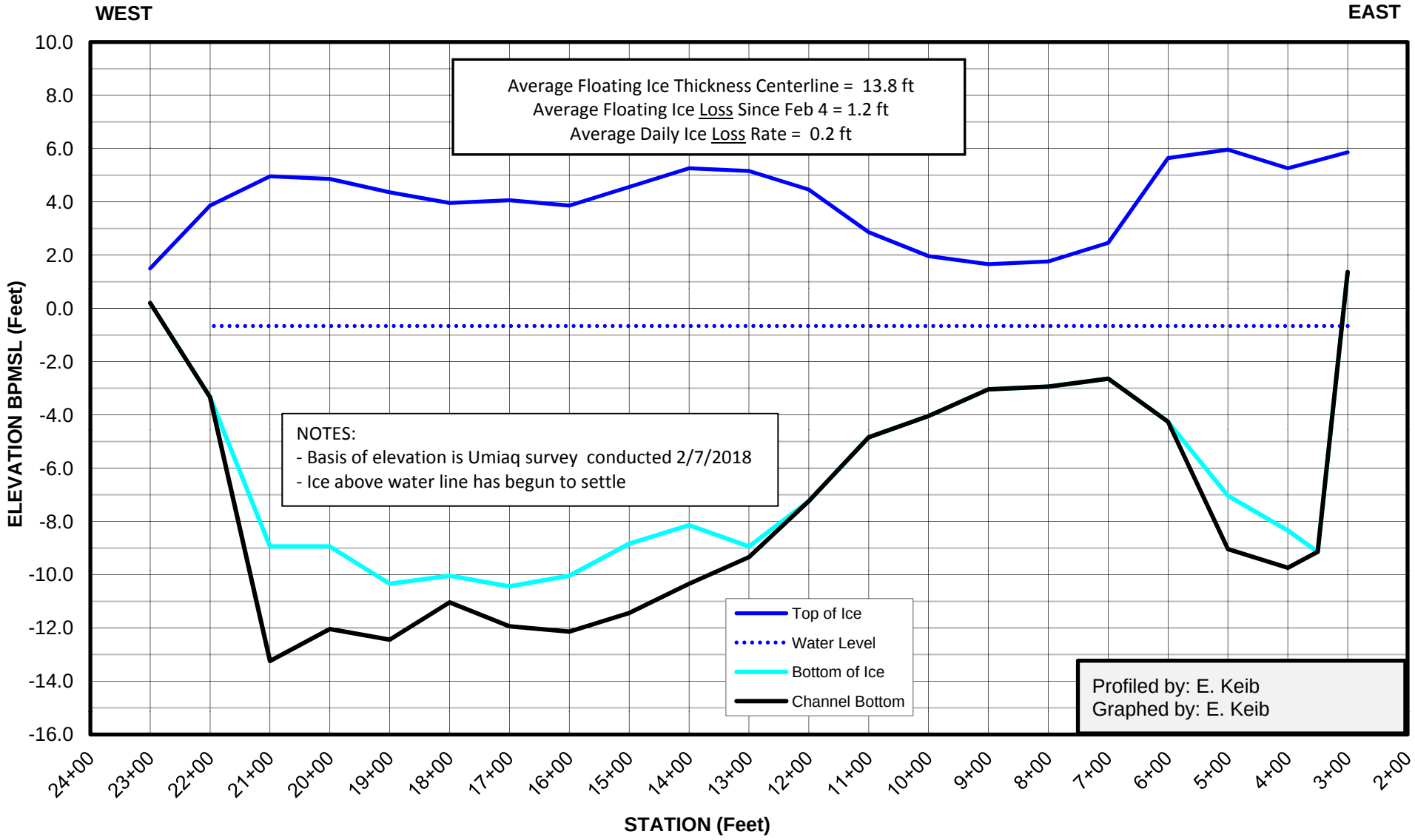
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
60' North of Centerline
6-Feb-2018



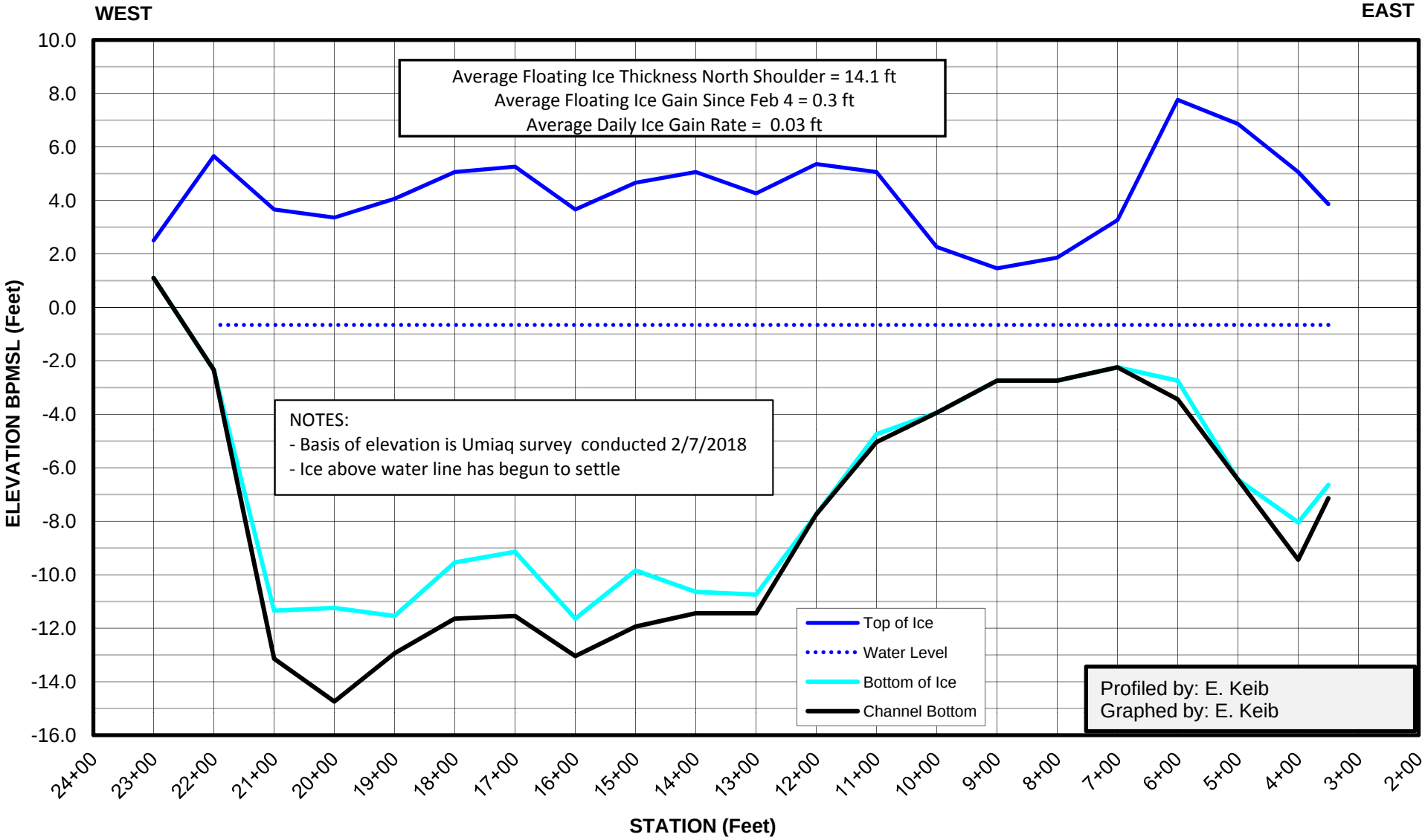
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
14-Feb-2018



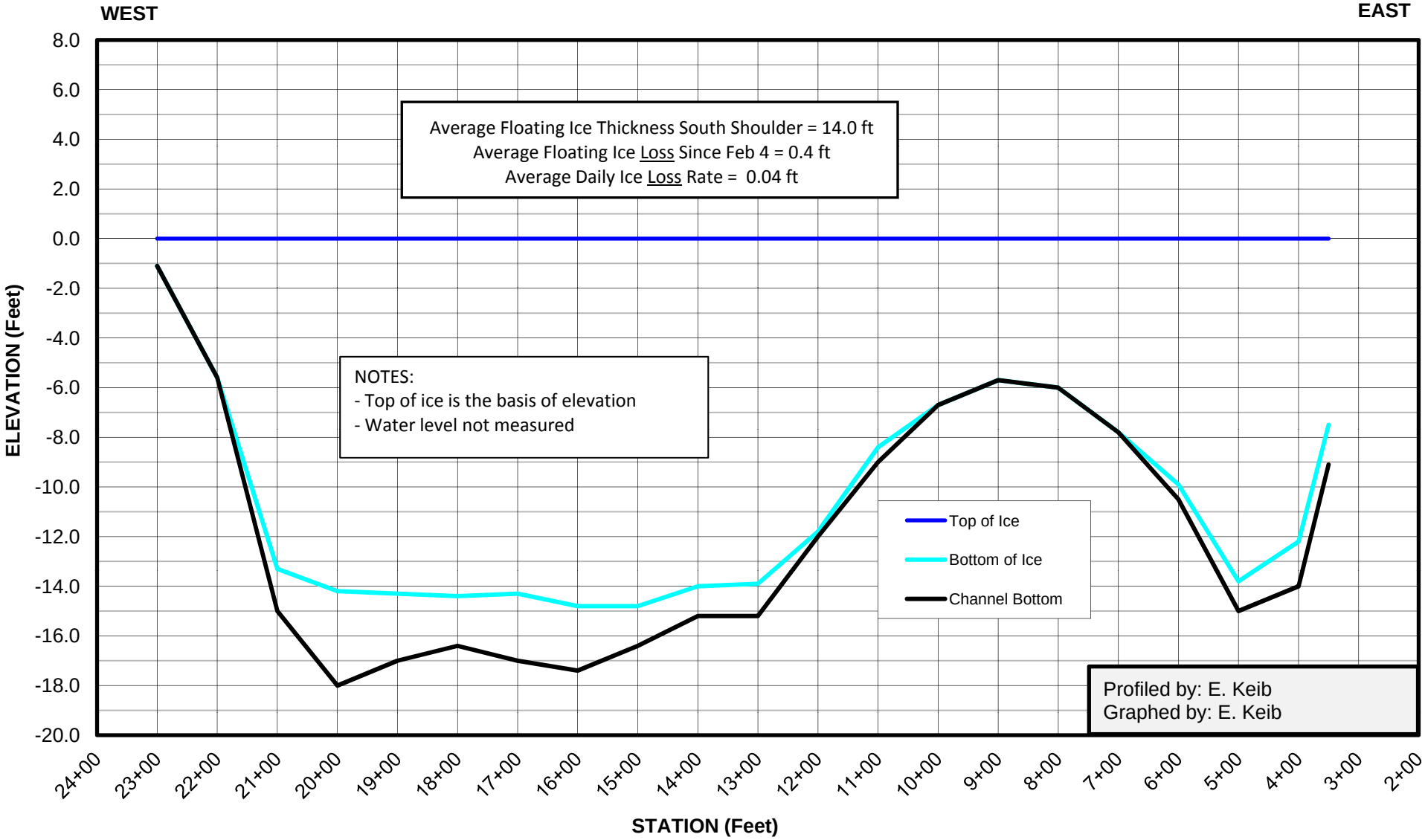
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
14-Feb-2018



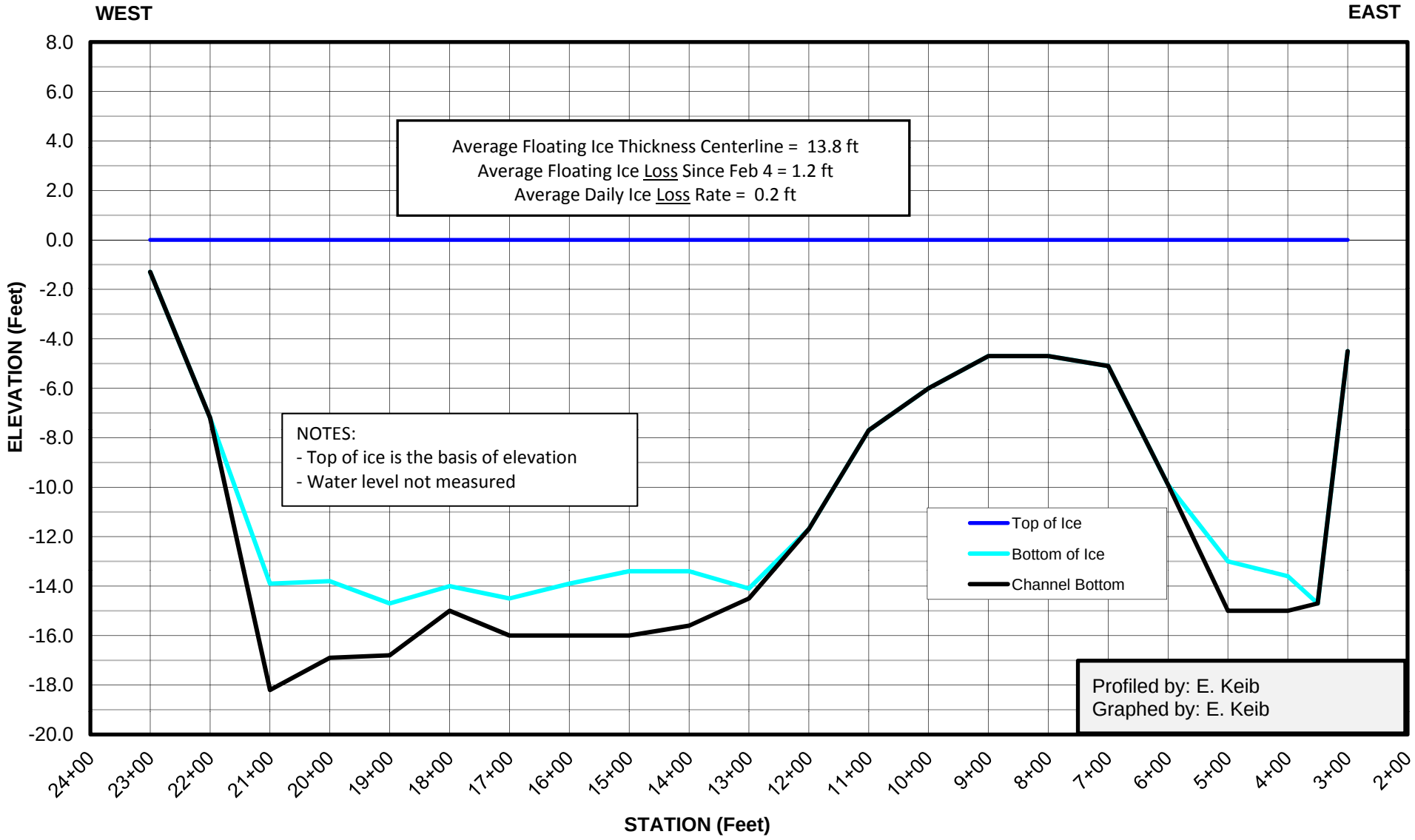
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
70' North of Centerline
14-Feb-2018



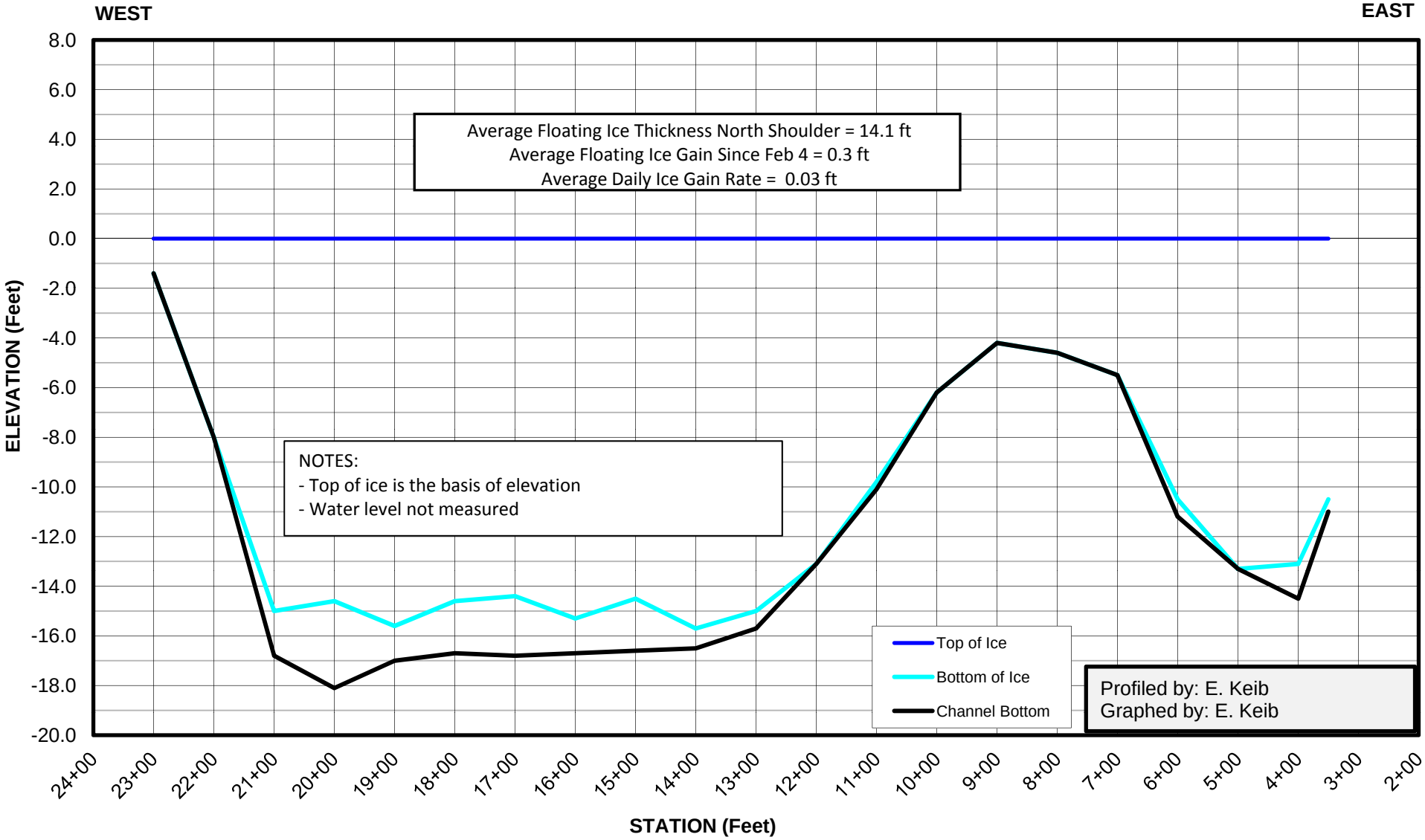
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
14-Feb-2018



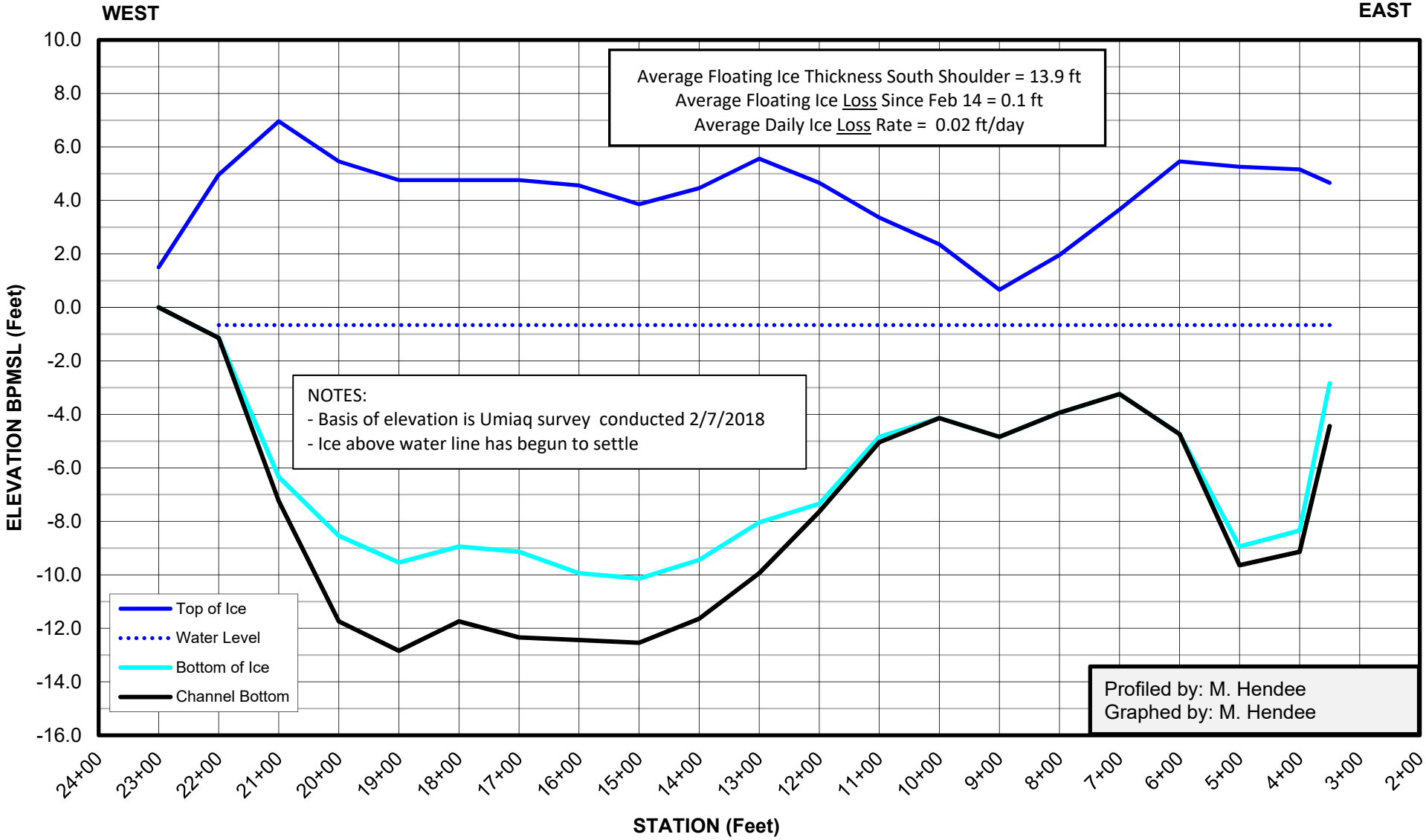
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
14-Feb-2018



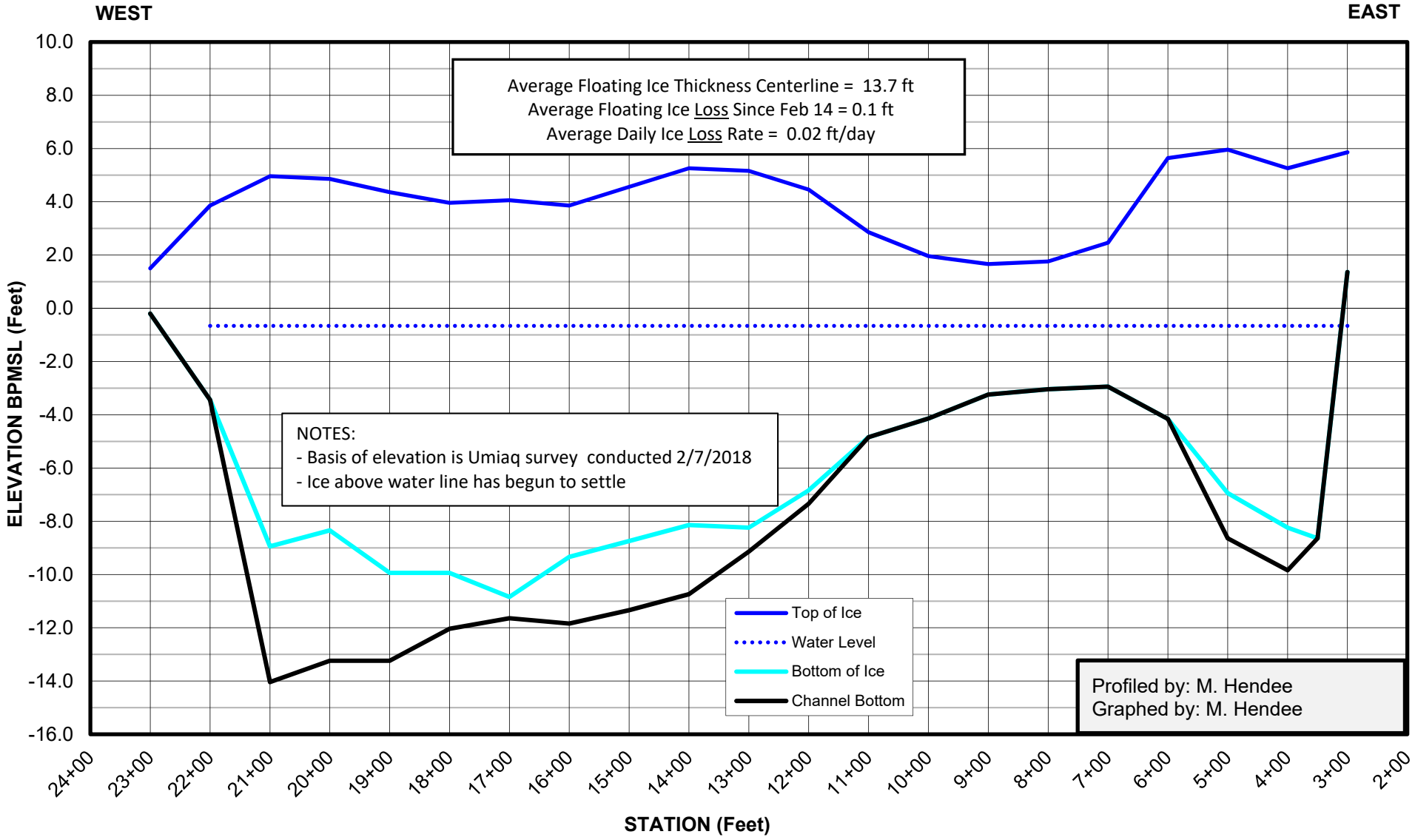
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
70' North of Centerline
14-Feb-2018



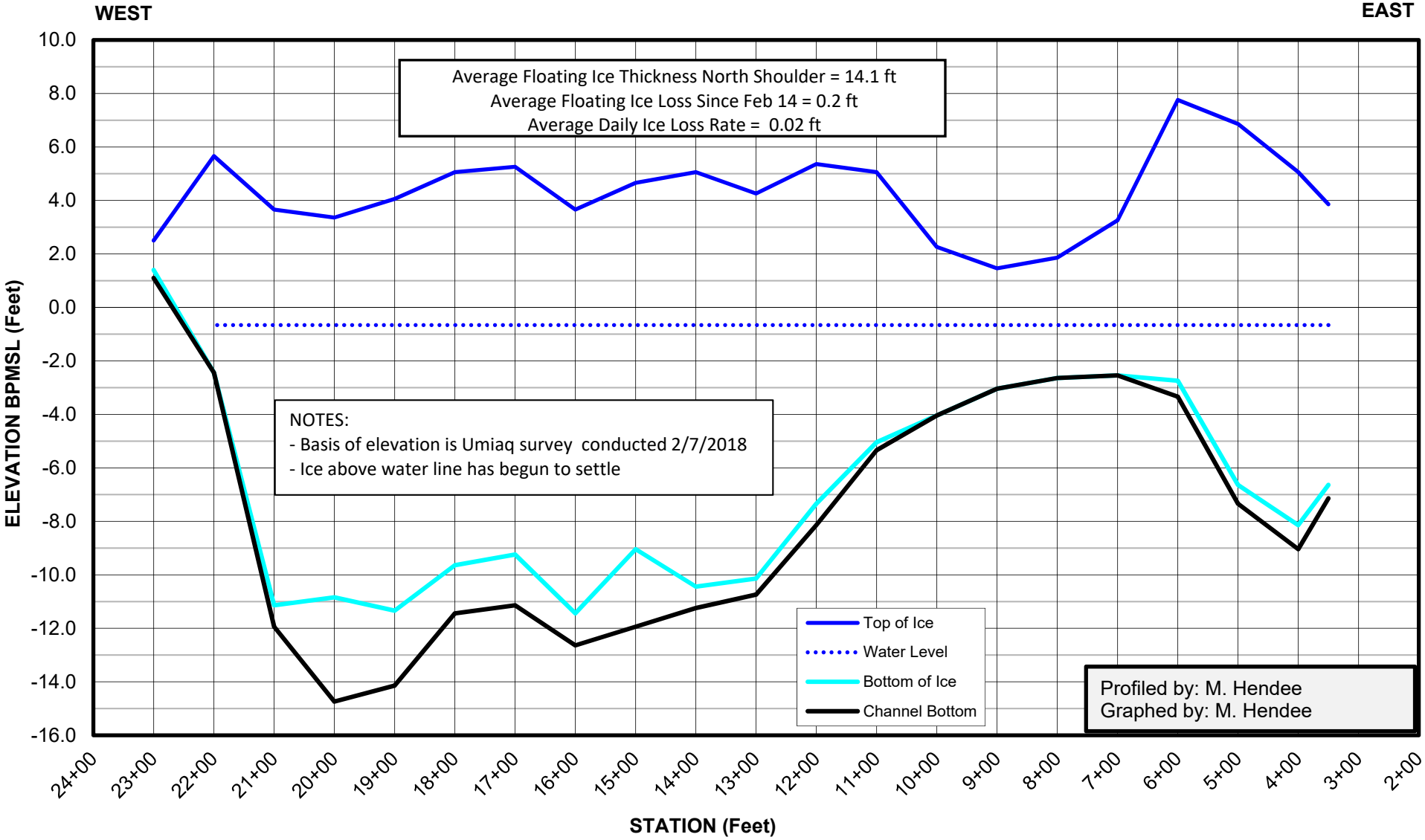
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
20-Feb-2018



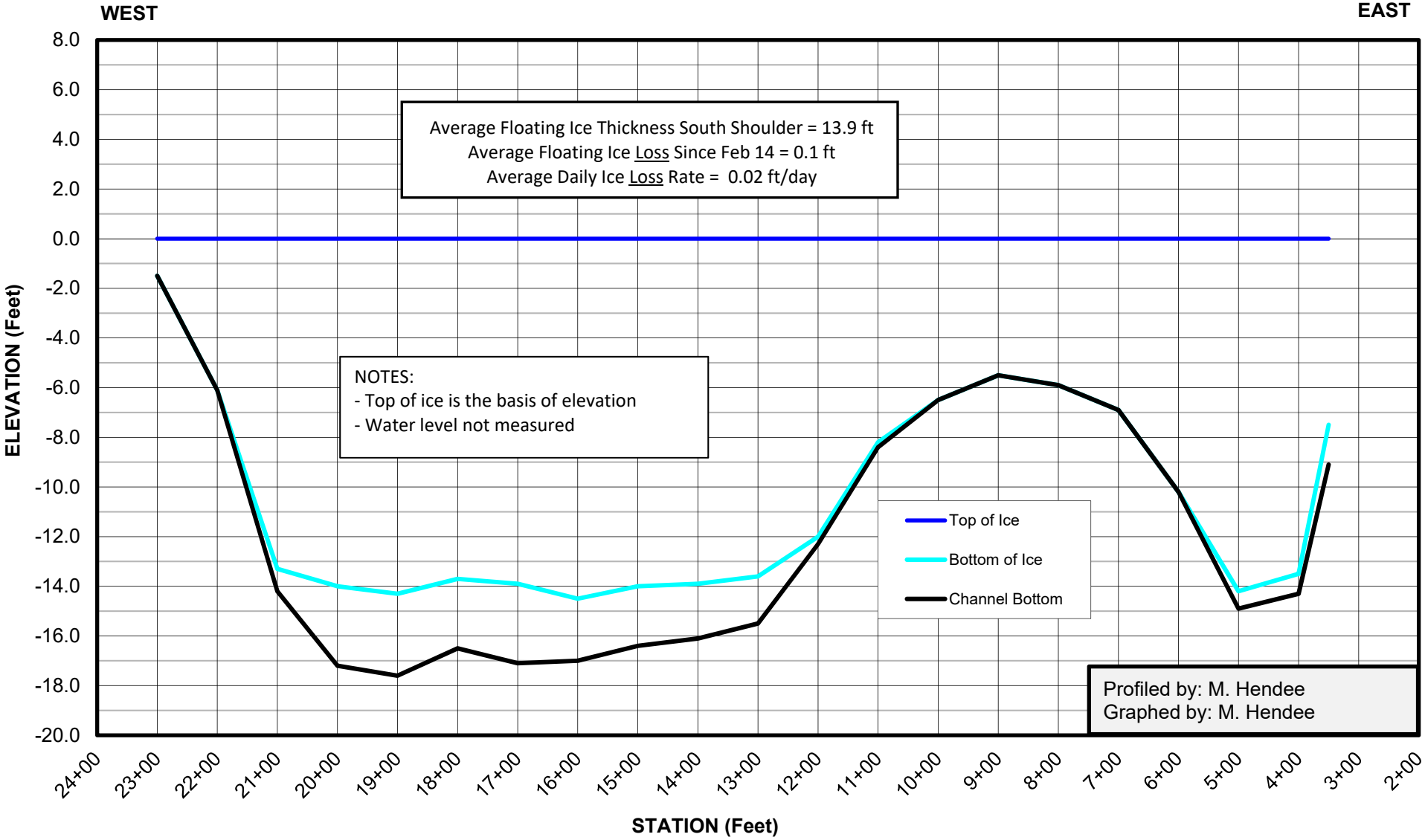
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
20-Feb-2018



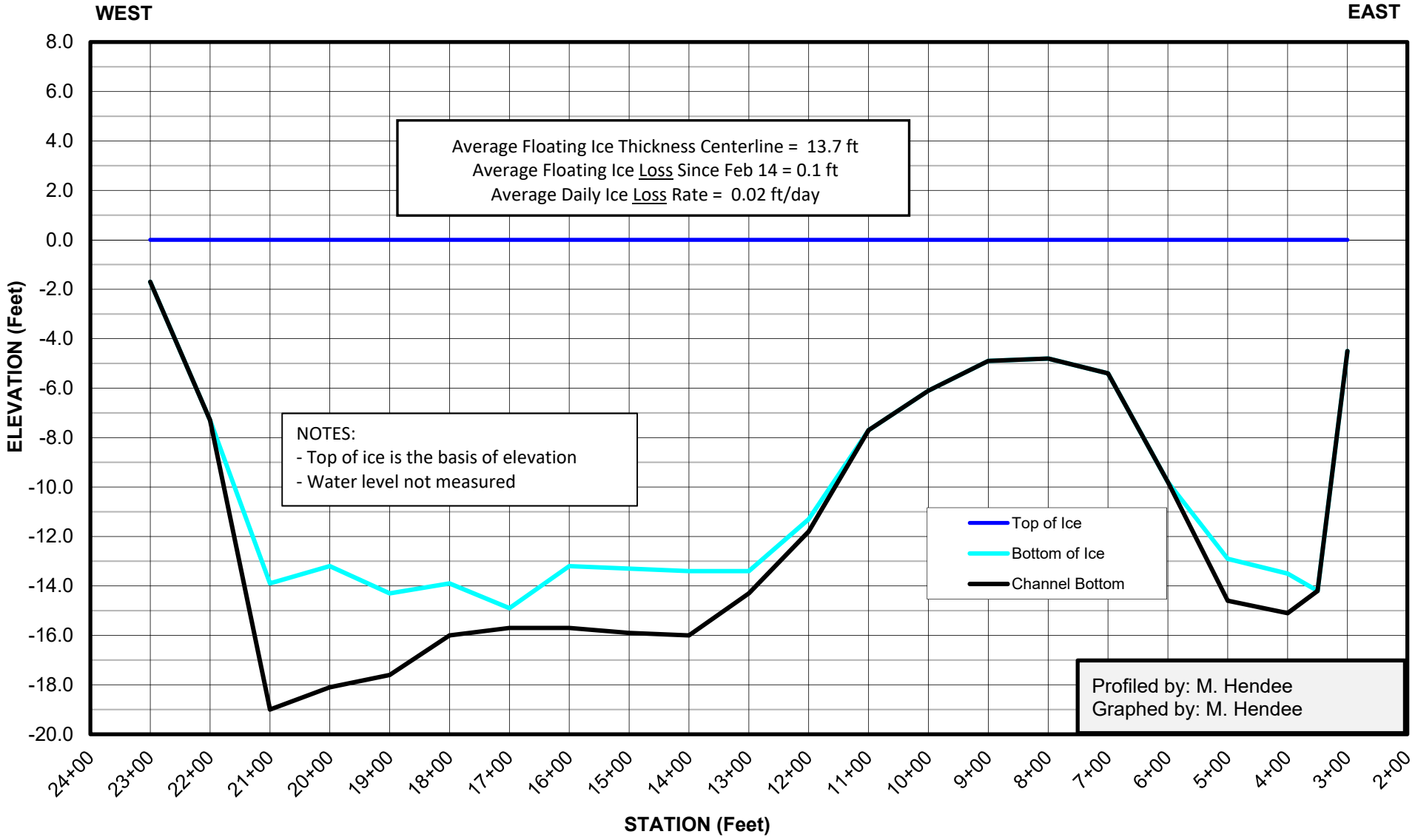
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
70' North of Centerline
20-Feb-2018



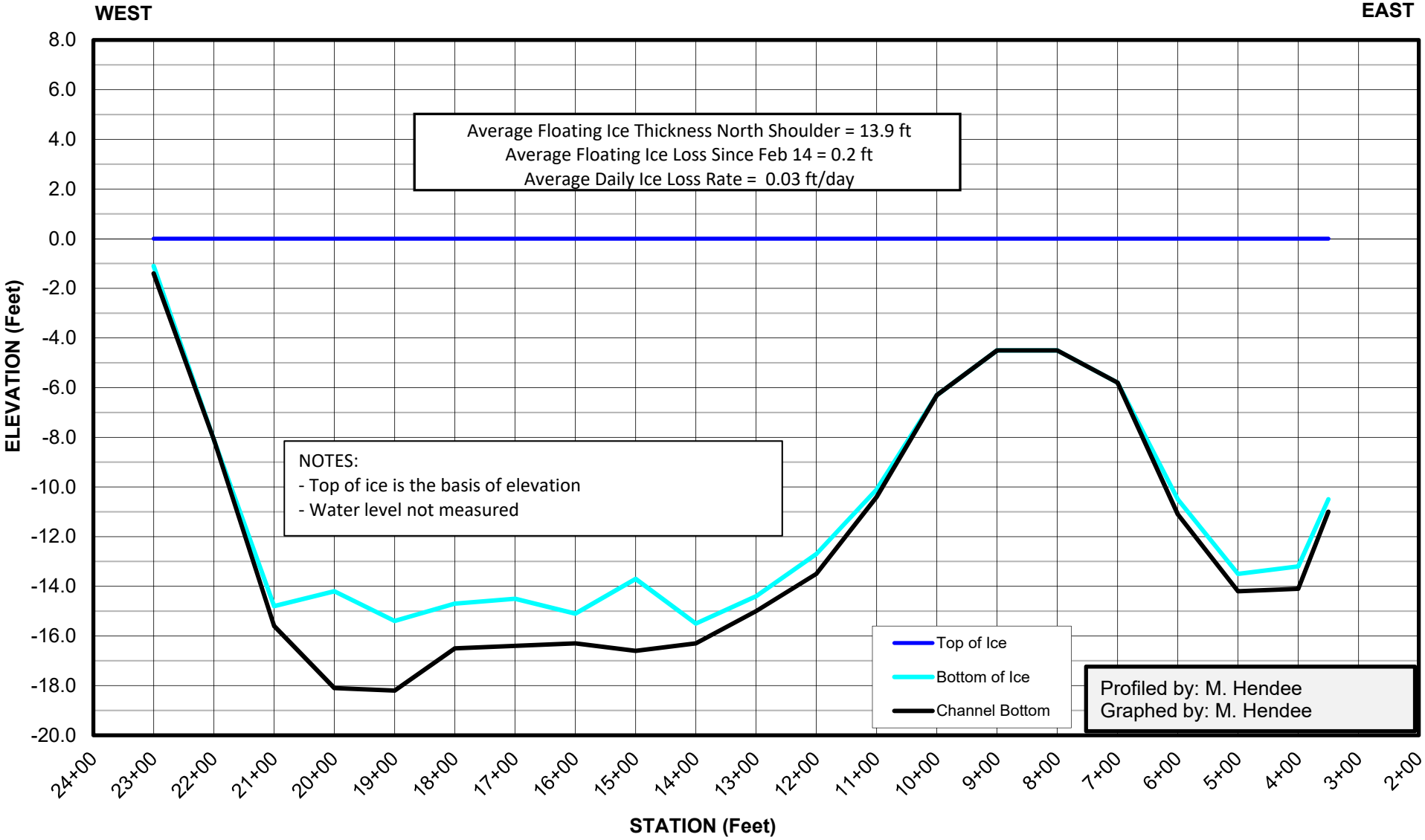
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
20-Feb-2018



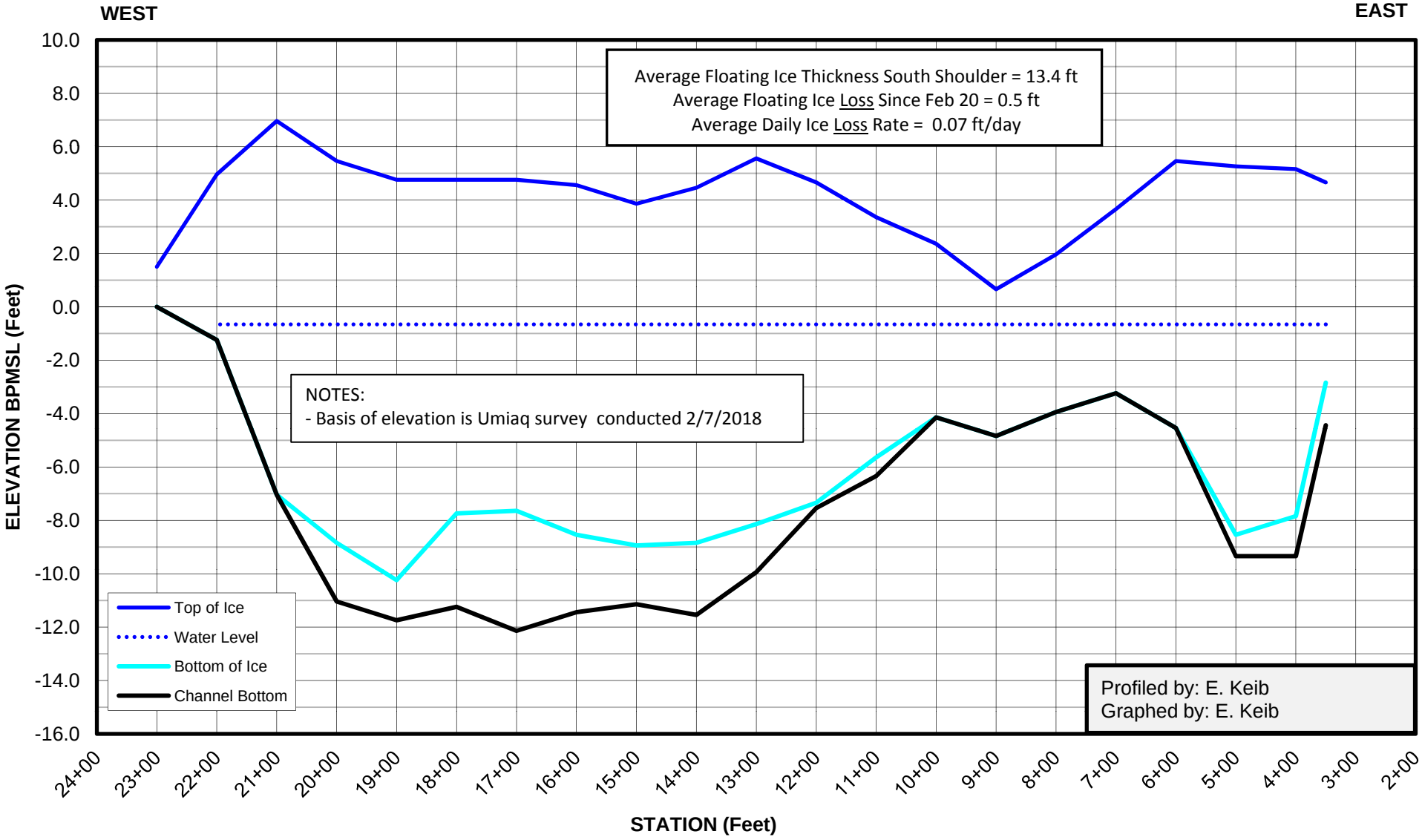
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
20-Feb-2018



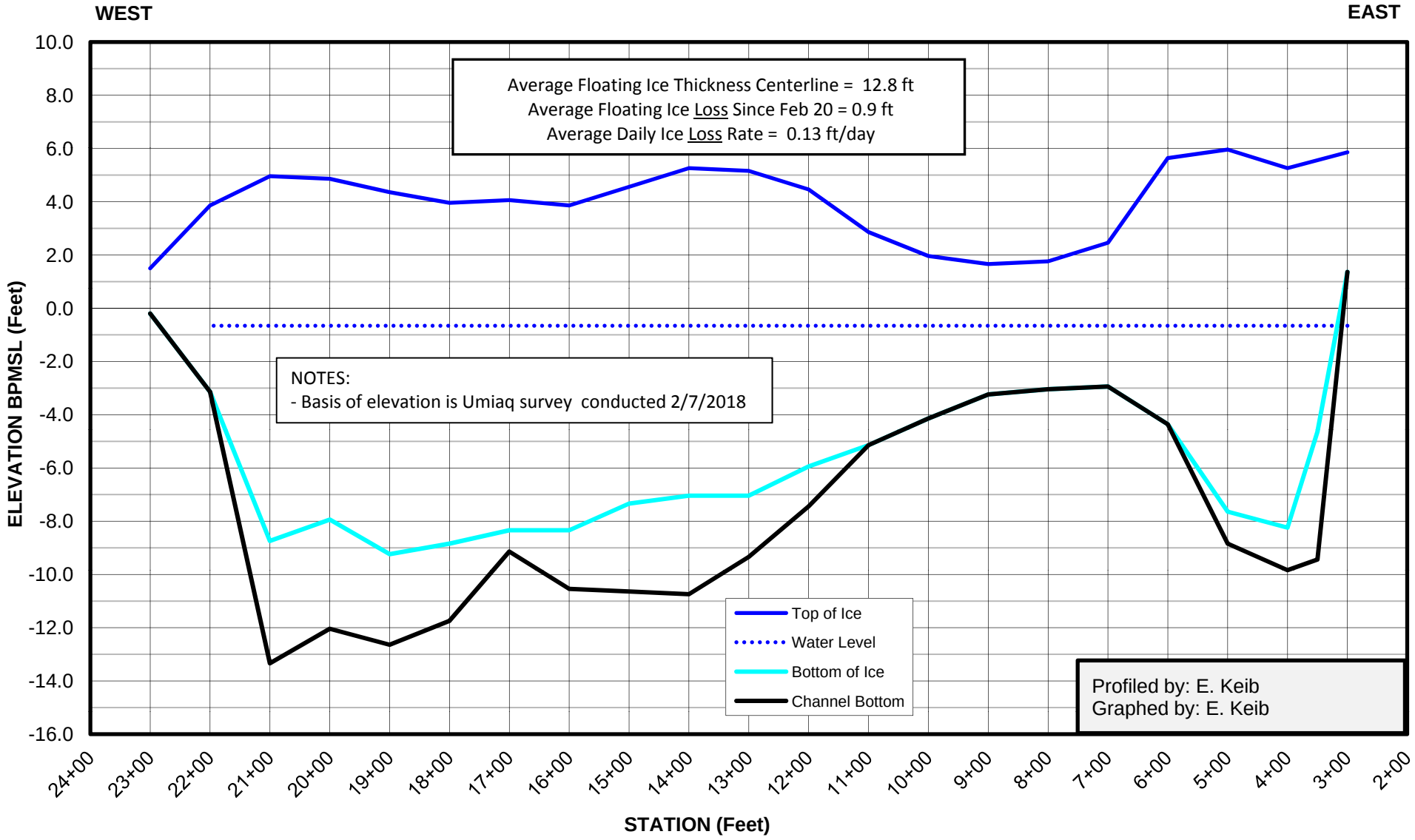
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
70' North of Centerline
20-Feb-2018



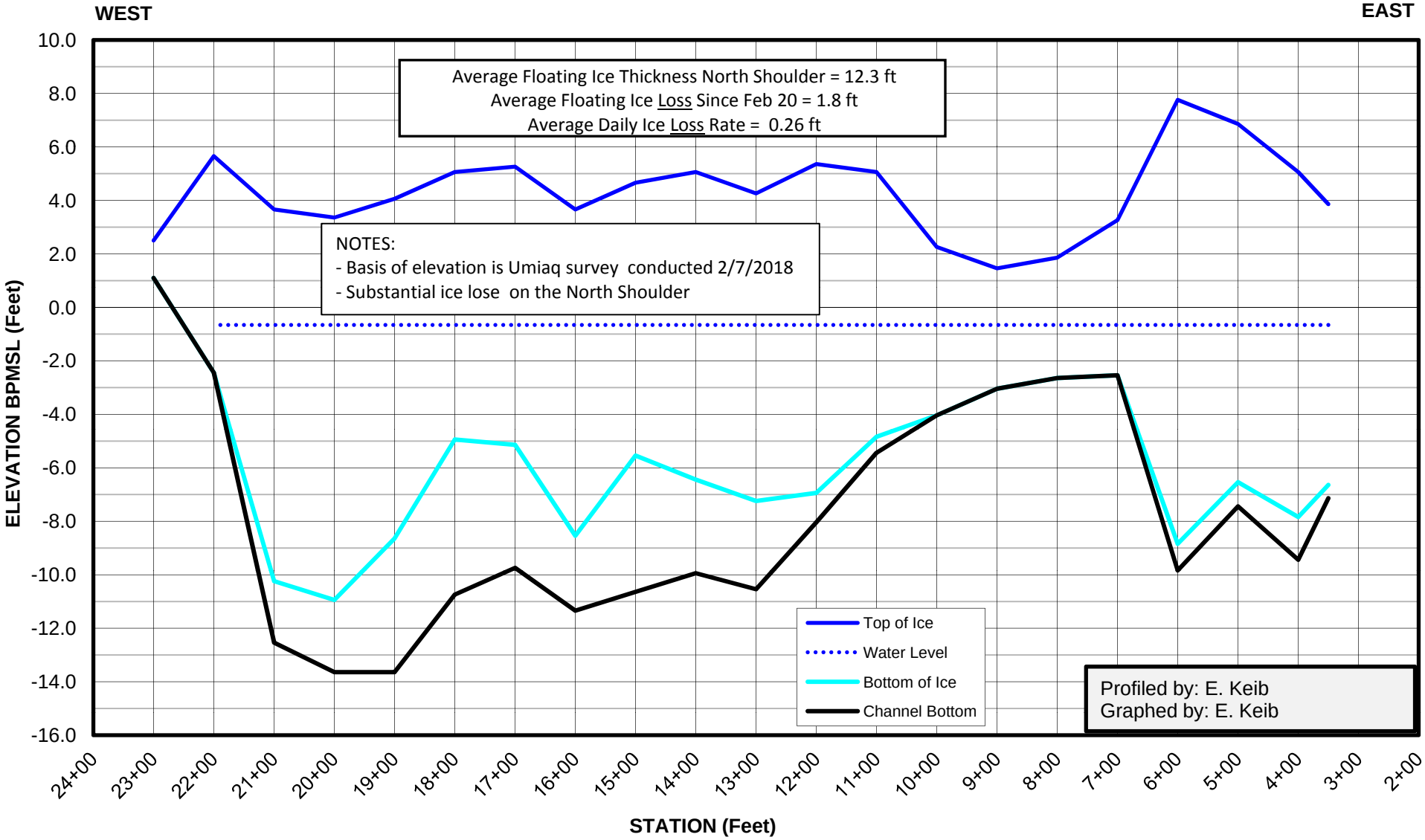
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
70' South of Centerline
28-Feb-2018



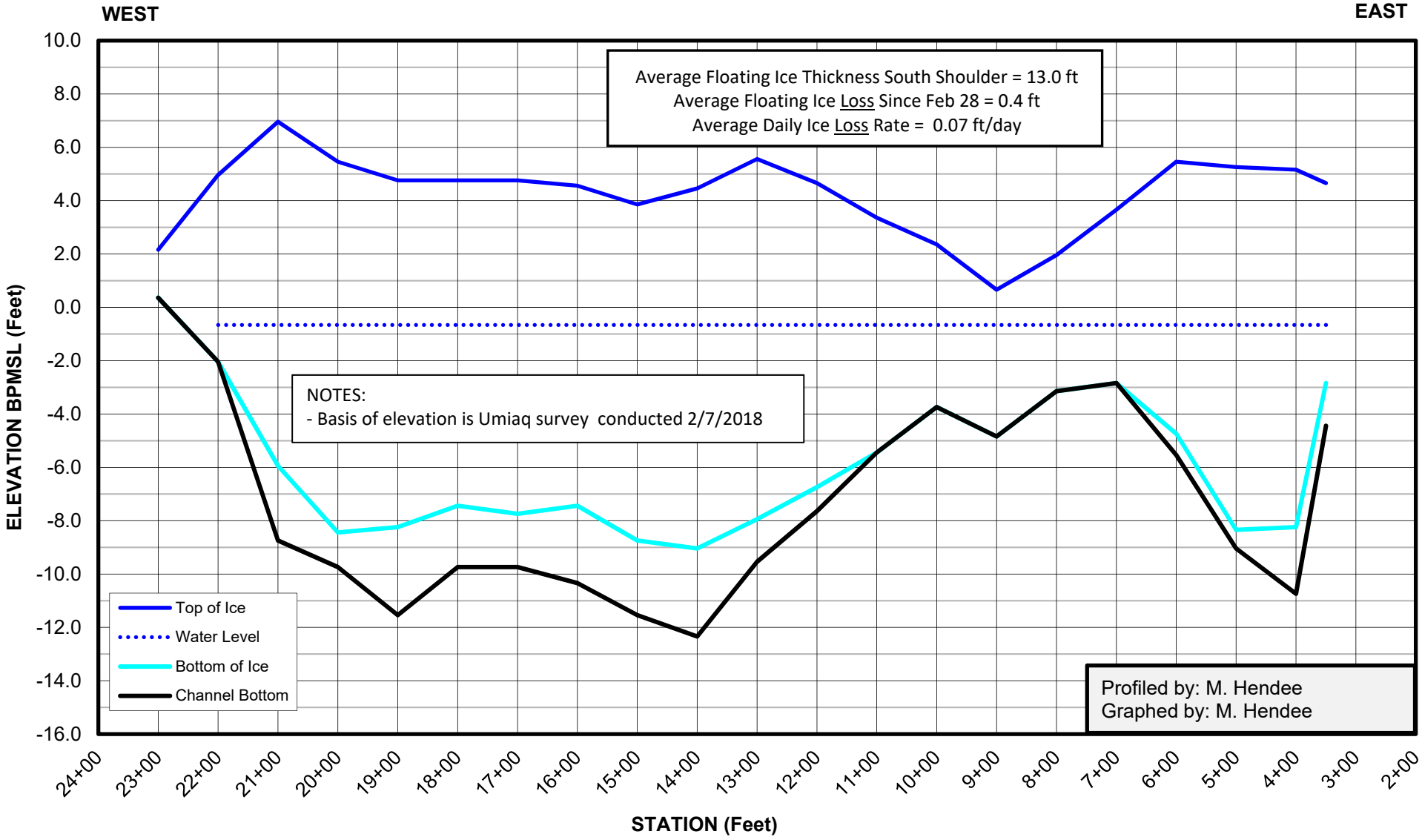
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
28-Feb-2018



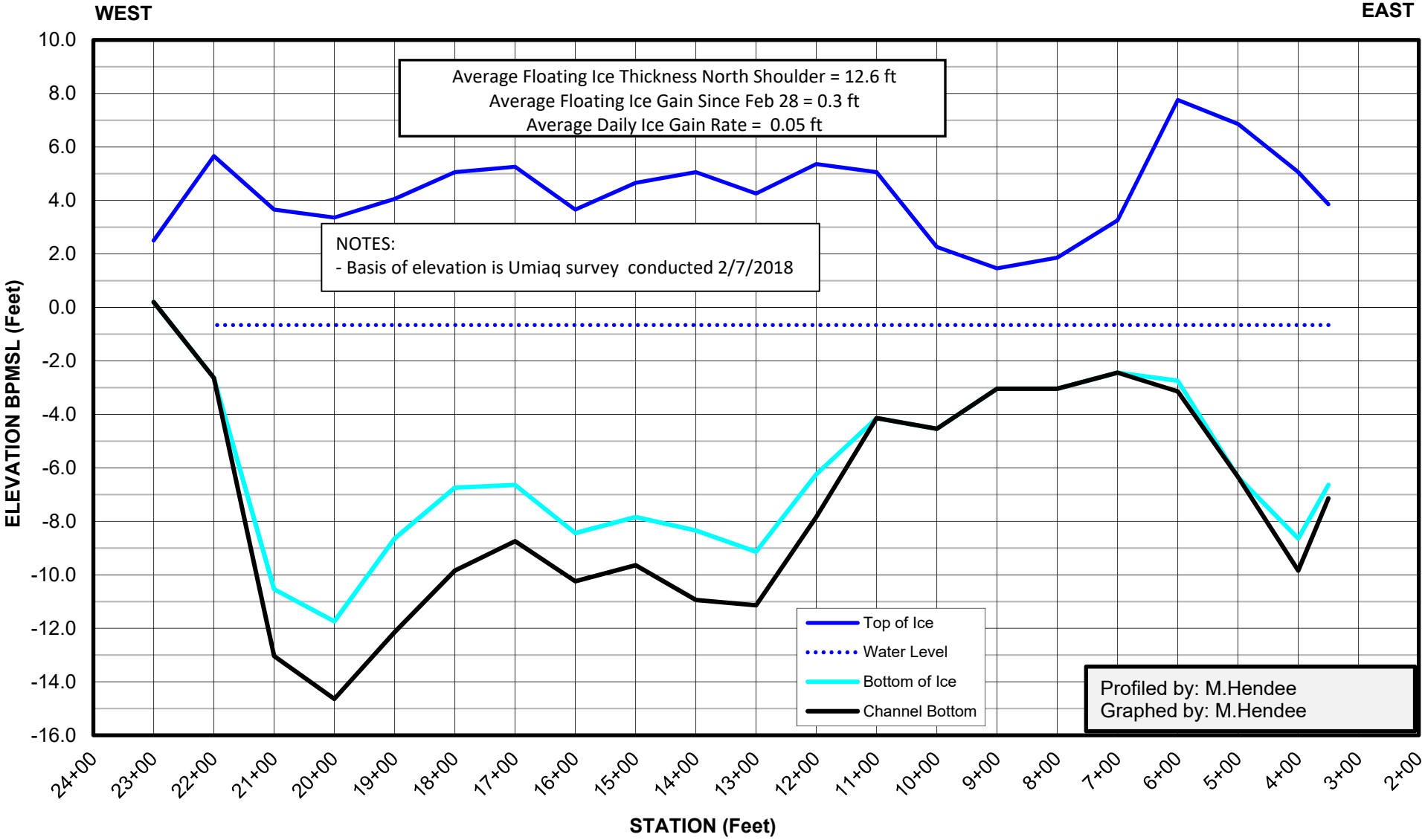
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
28-Feb-2018



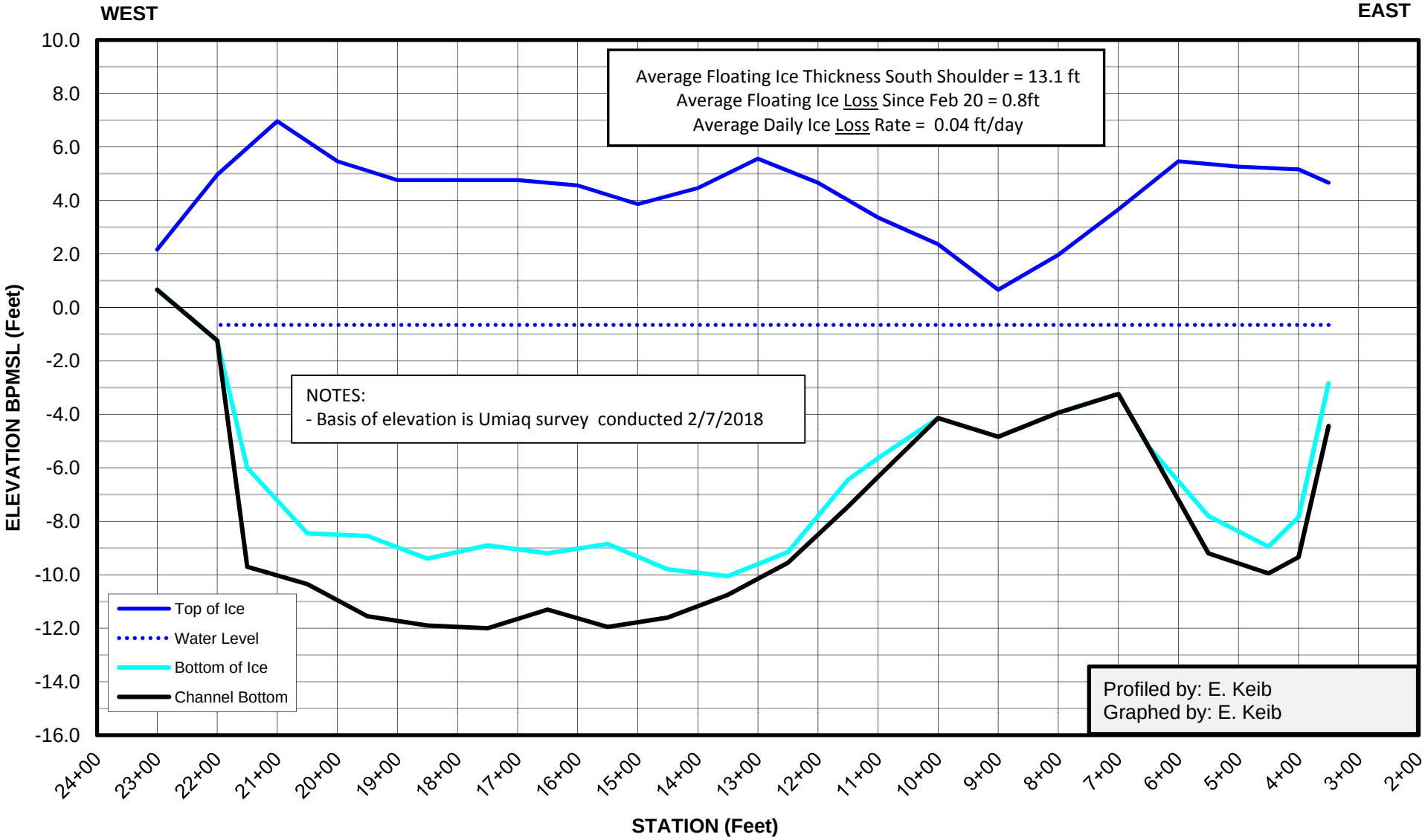
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH DRIVE LANE
45' South of Centerline
07-Mar-2018



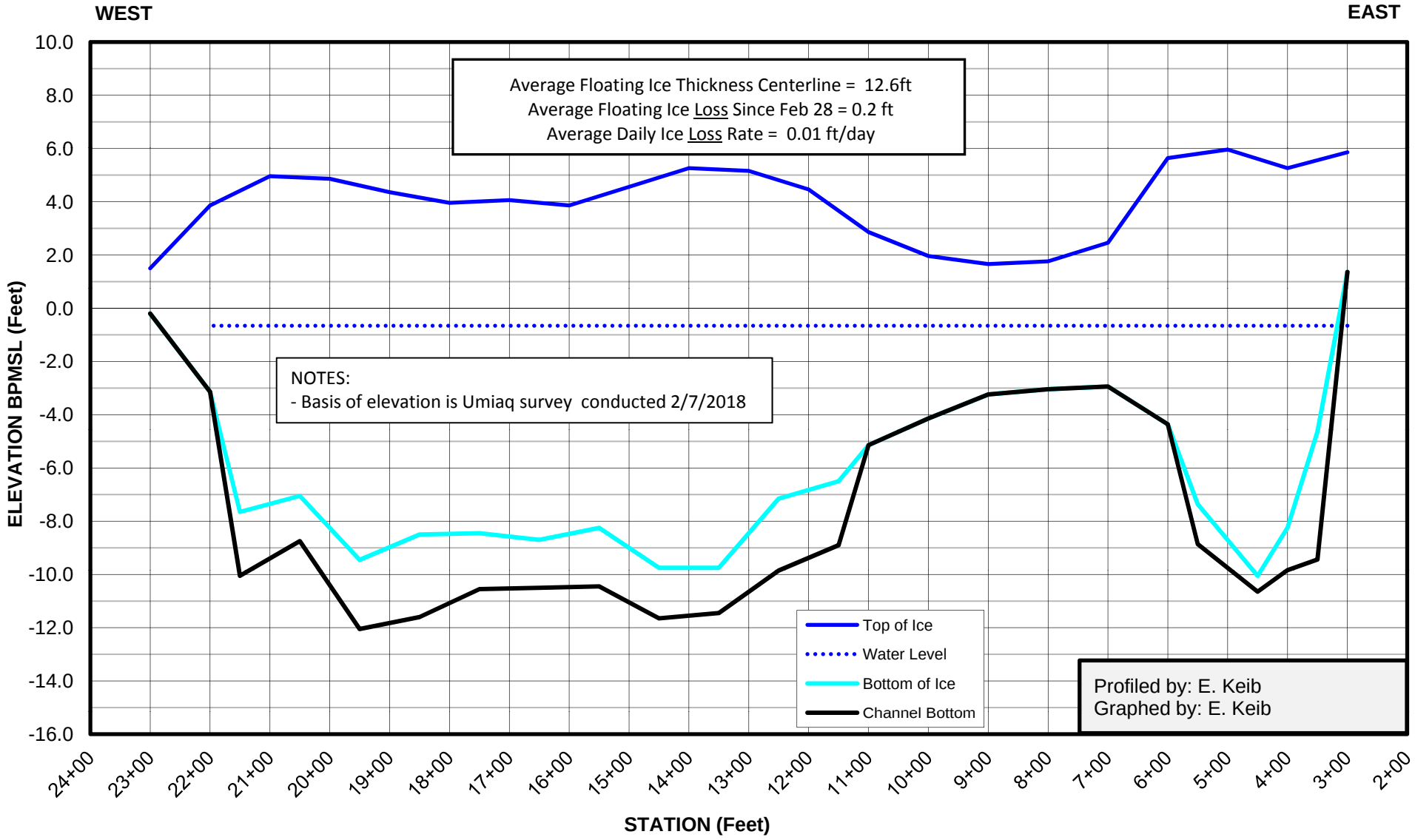
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH DRIVE LANE
45' North of Centerline
07-Mar-2018



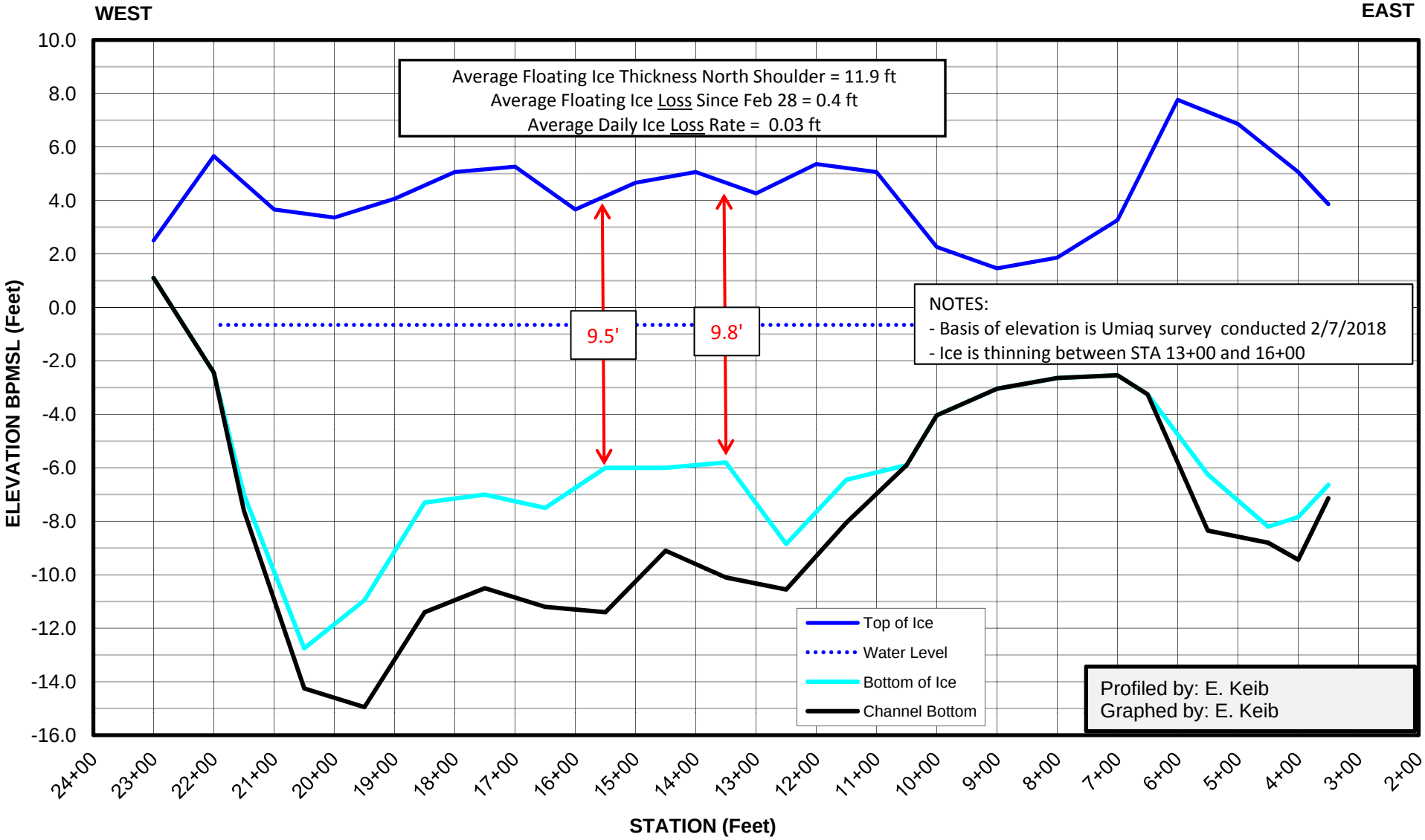
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
14-Mar-2018



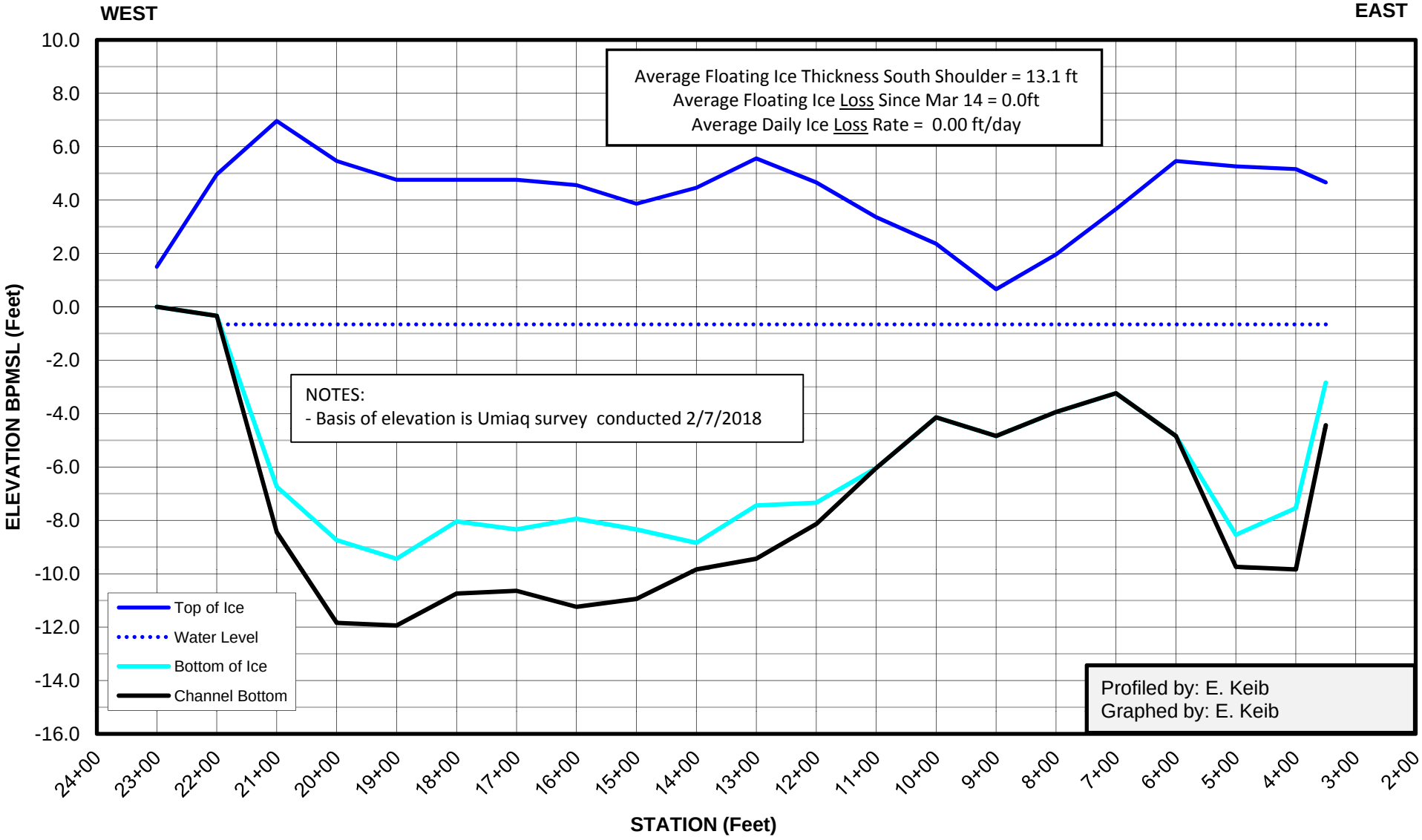
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
14-Mar-2018



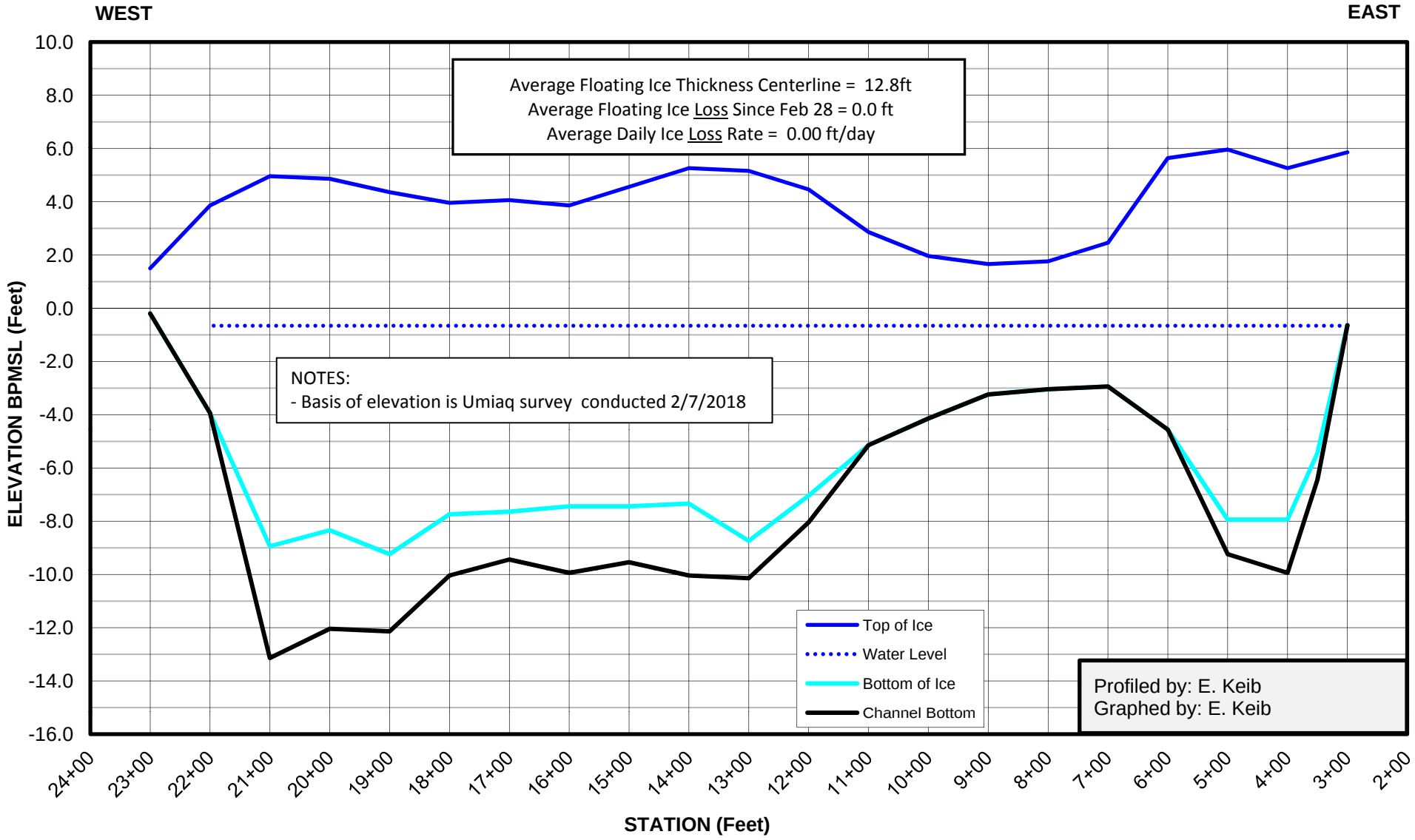
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
14-Mar-2018



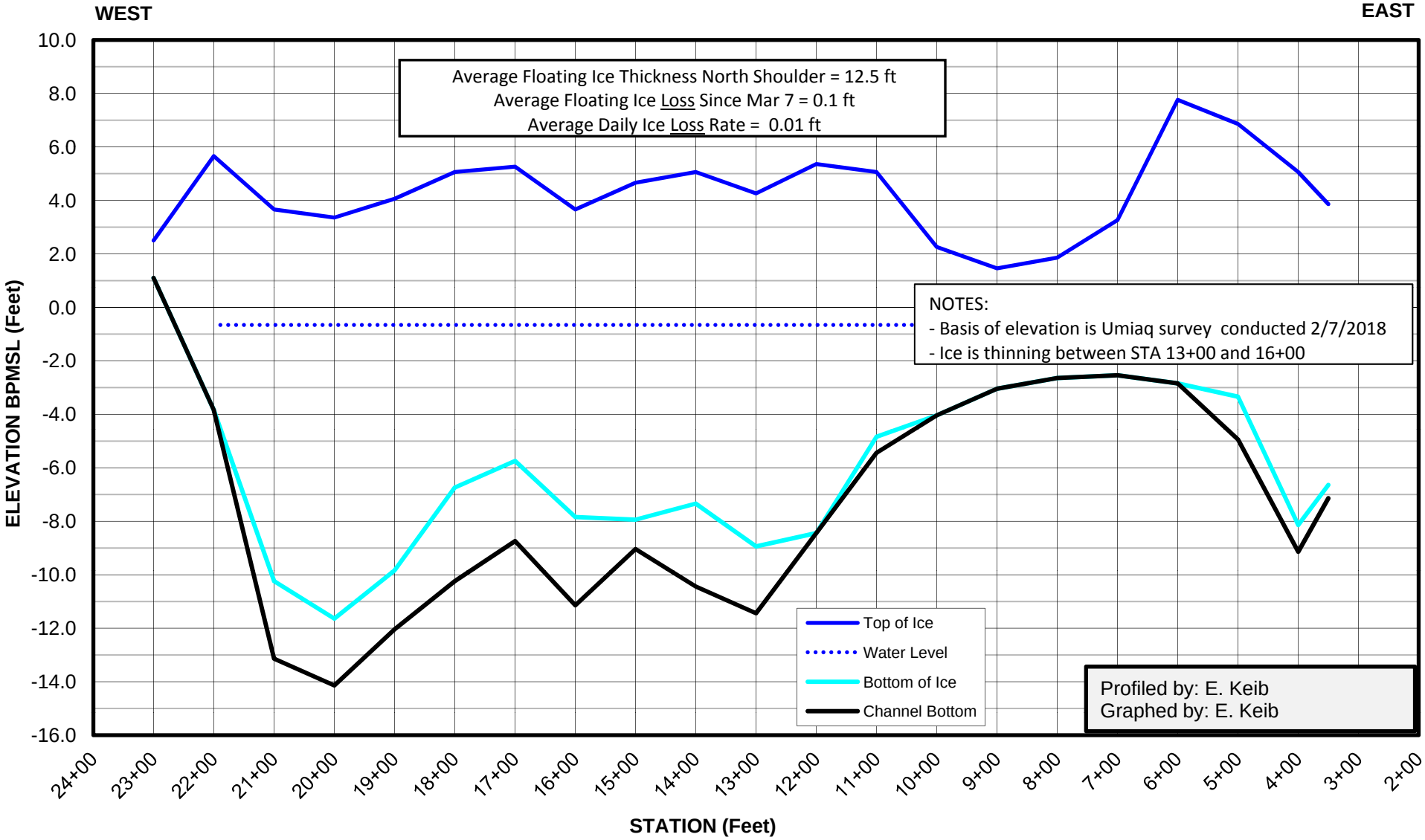
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
19-Mar-2018



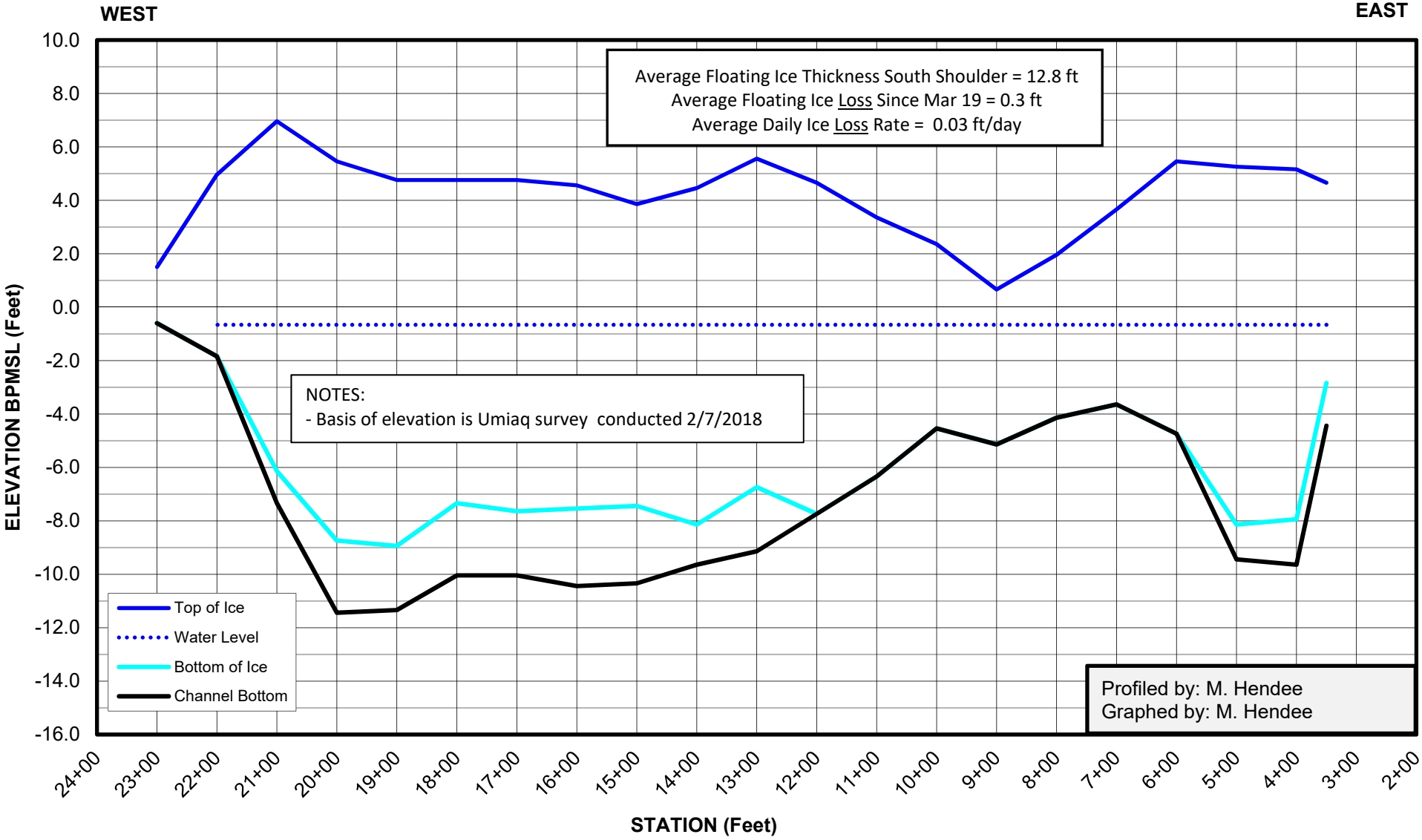
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
19-Mar-2018



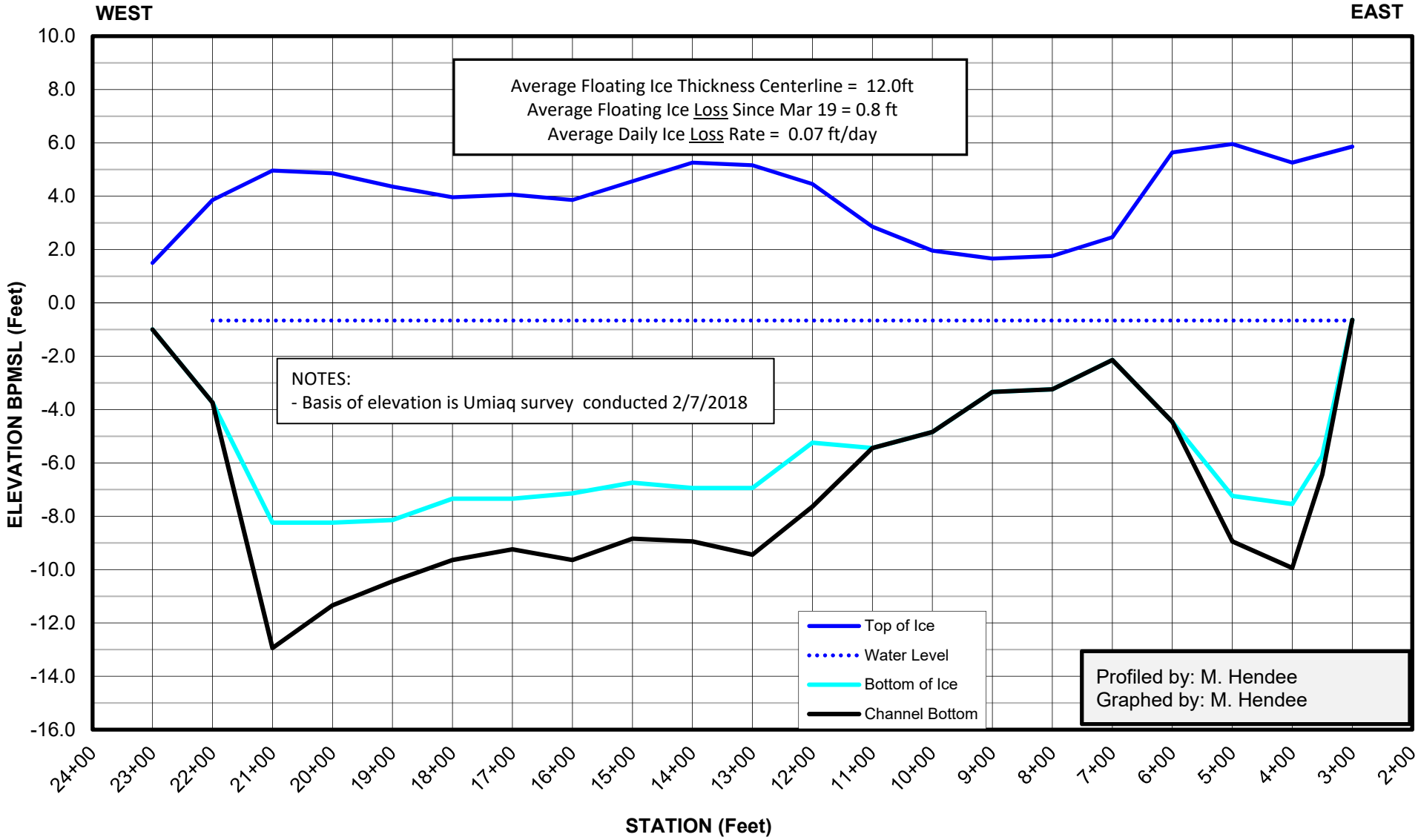
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
70' North of Centerline
19-Mar-2018



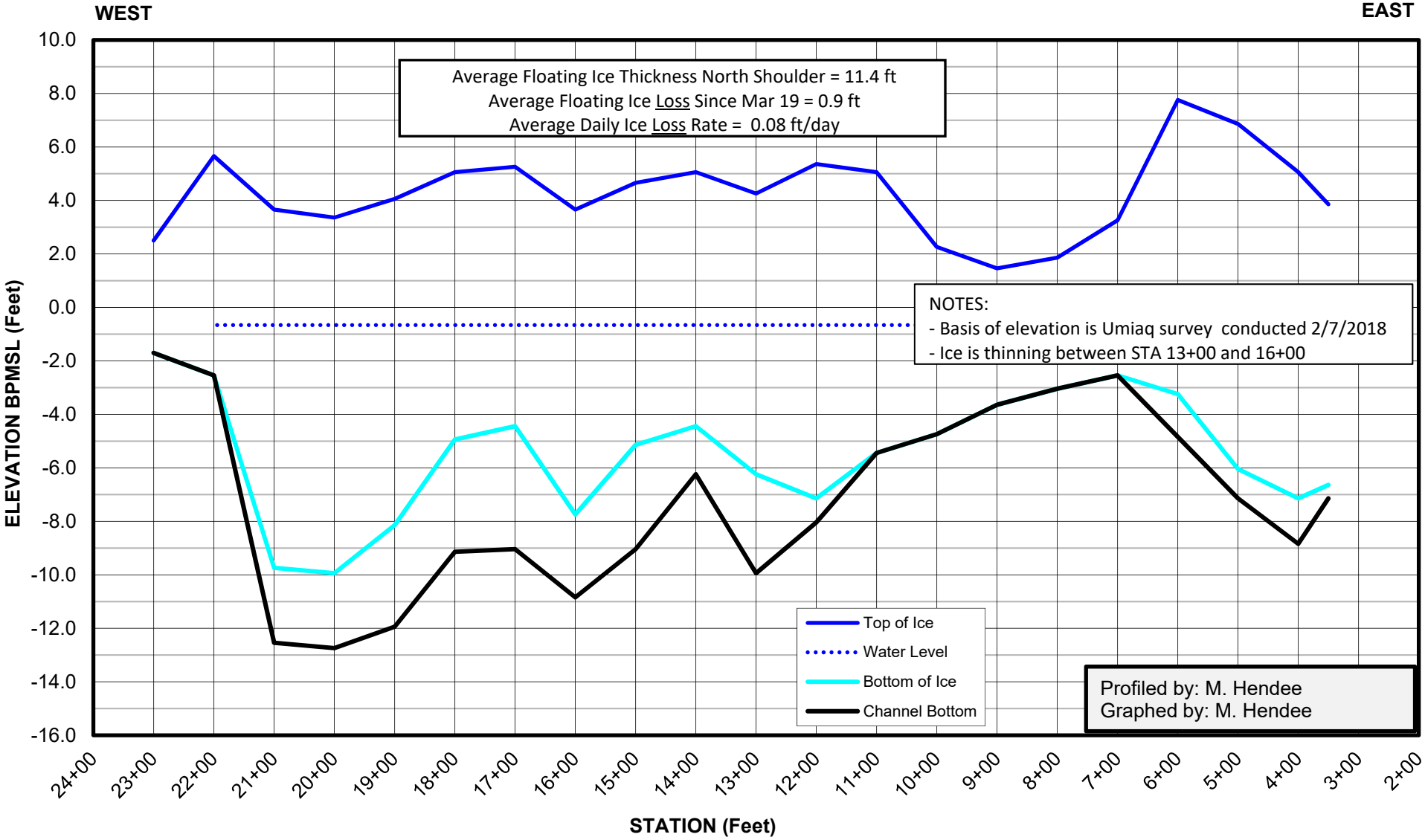
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
70' South of Centerline
31-Mar-2018



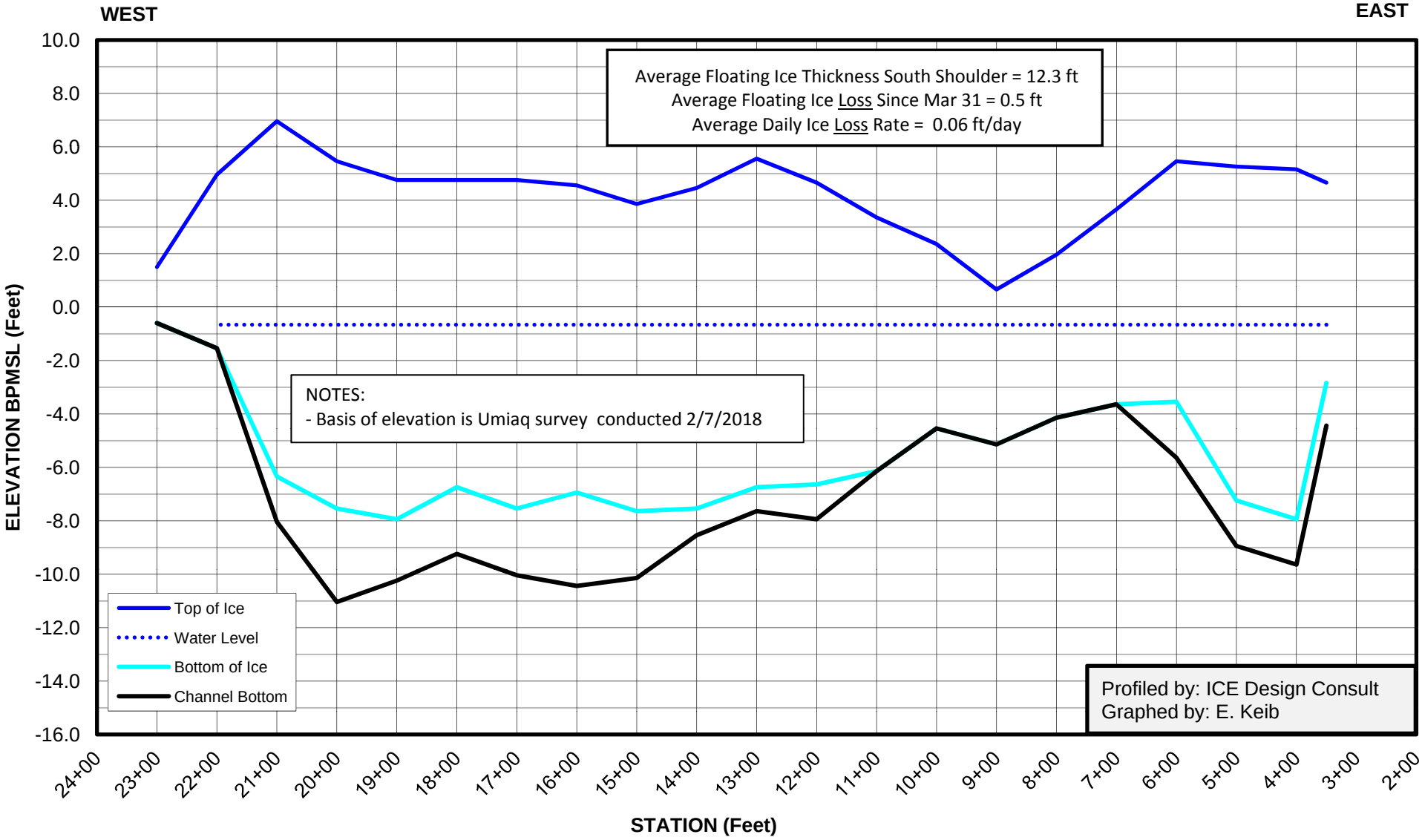
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
31-Mar-2018



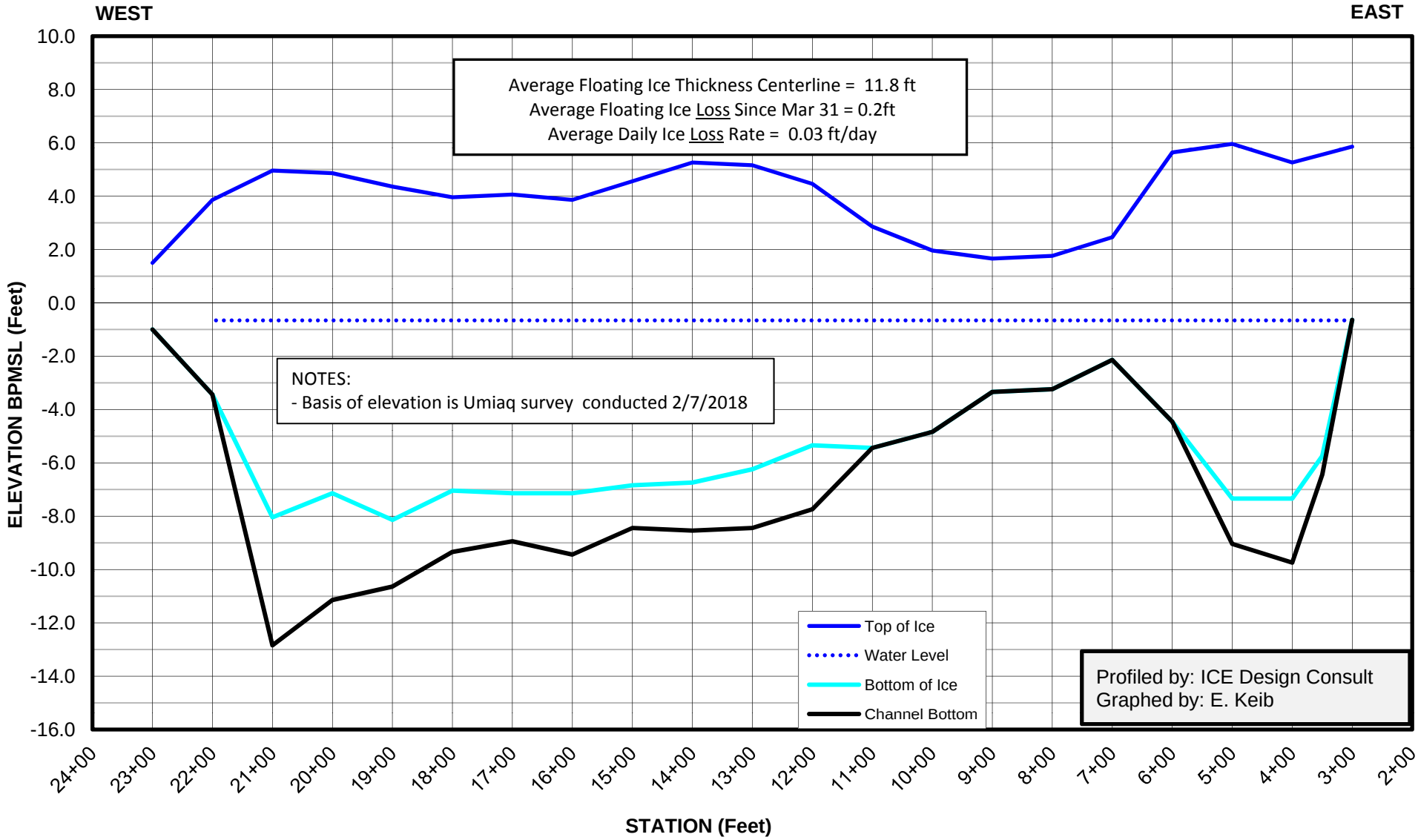
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
31-Mar-2018



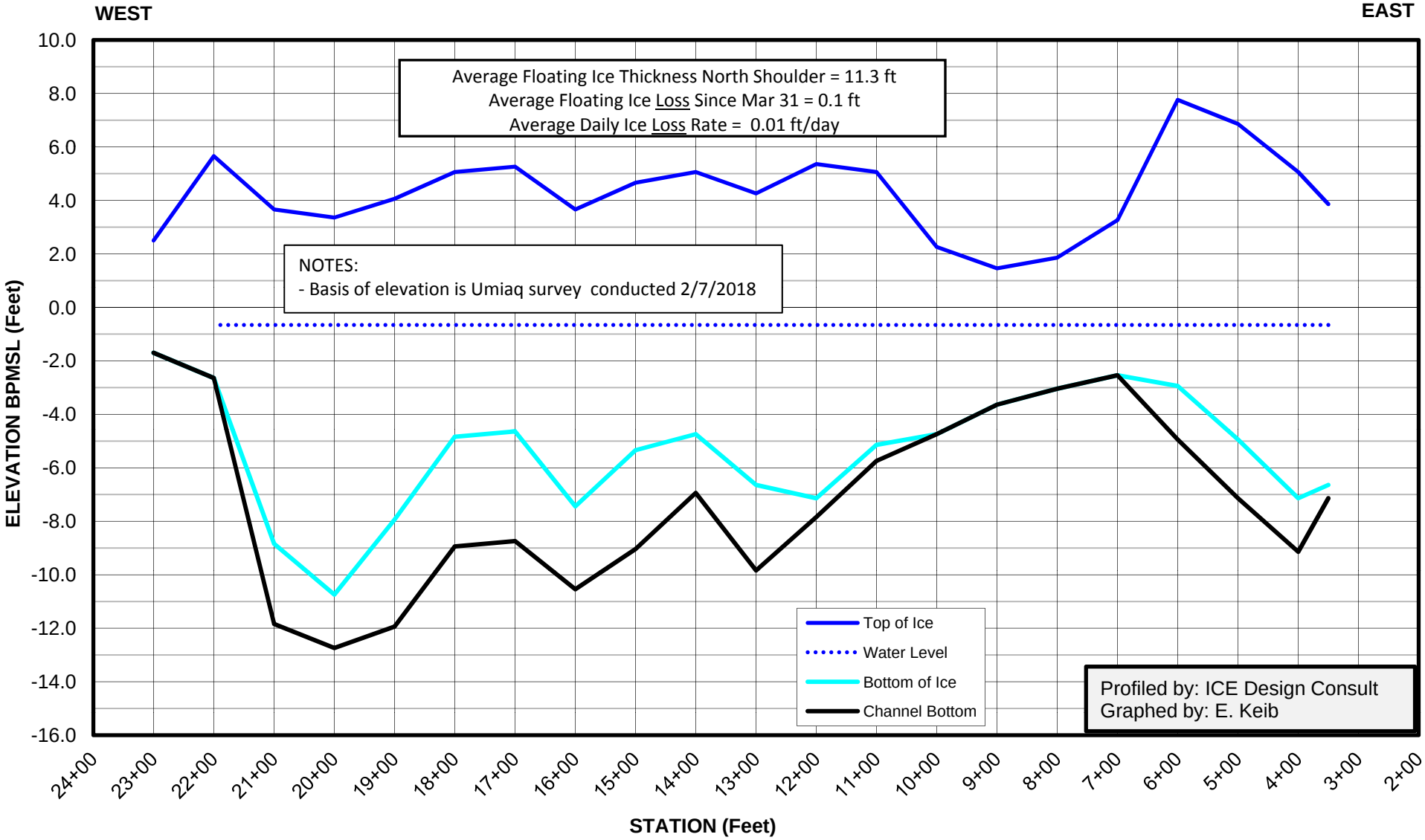
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
8-Apr-2018



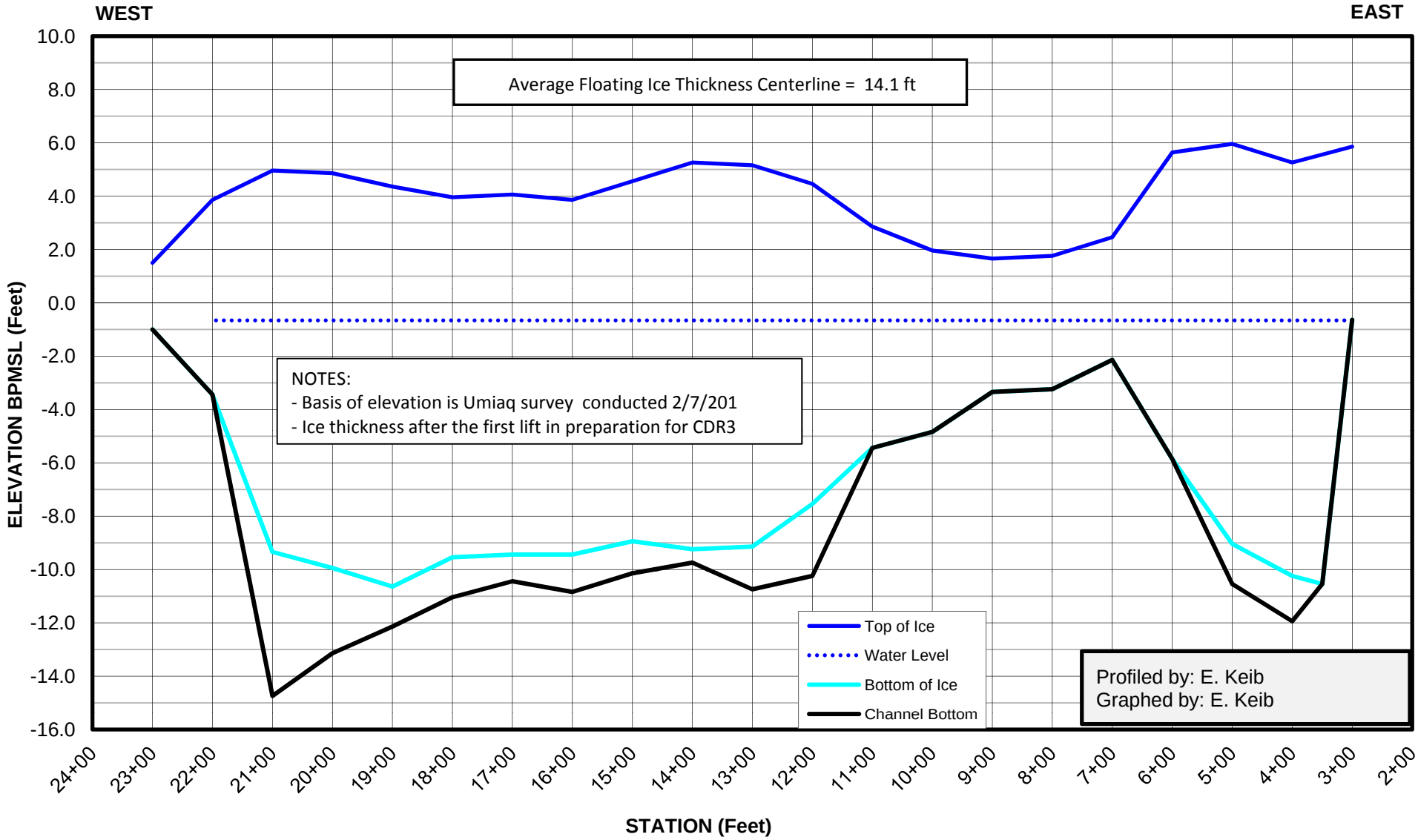
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
8-Apr-2018



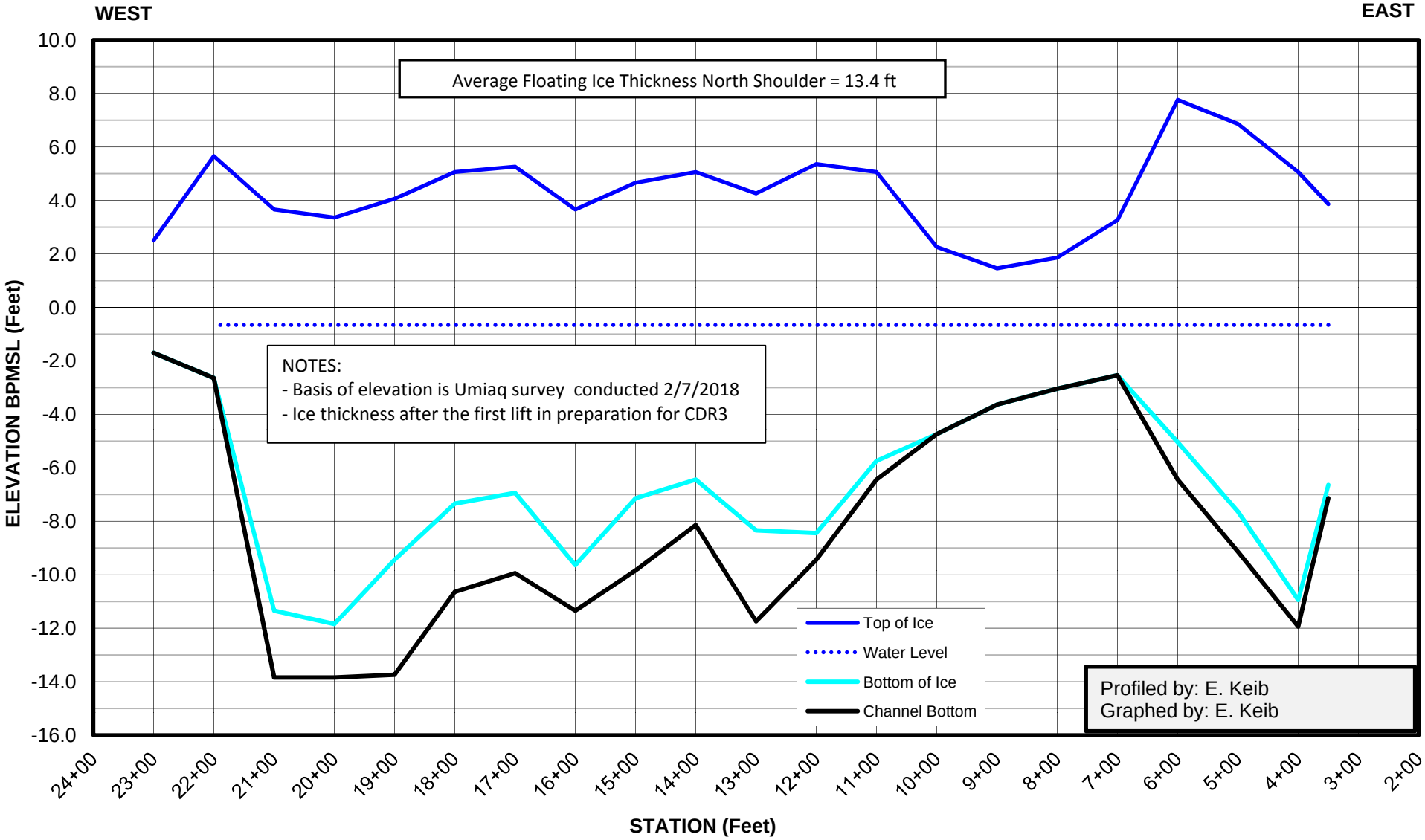
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
8-Apr-2018



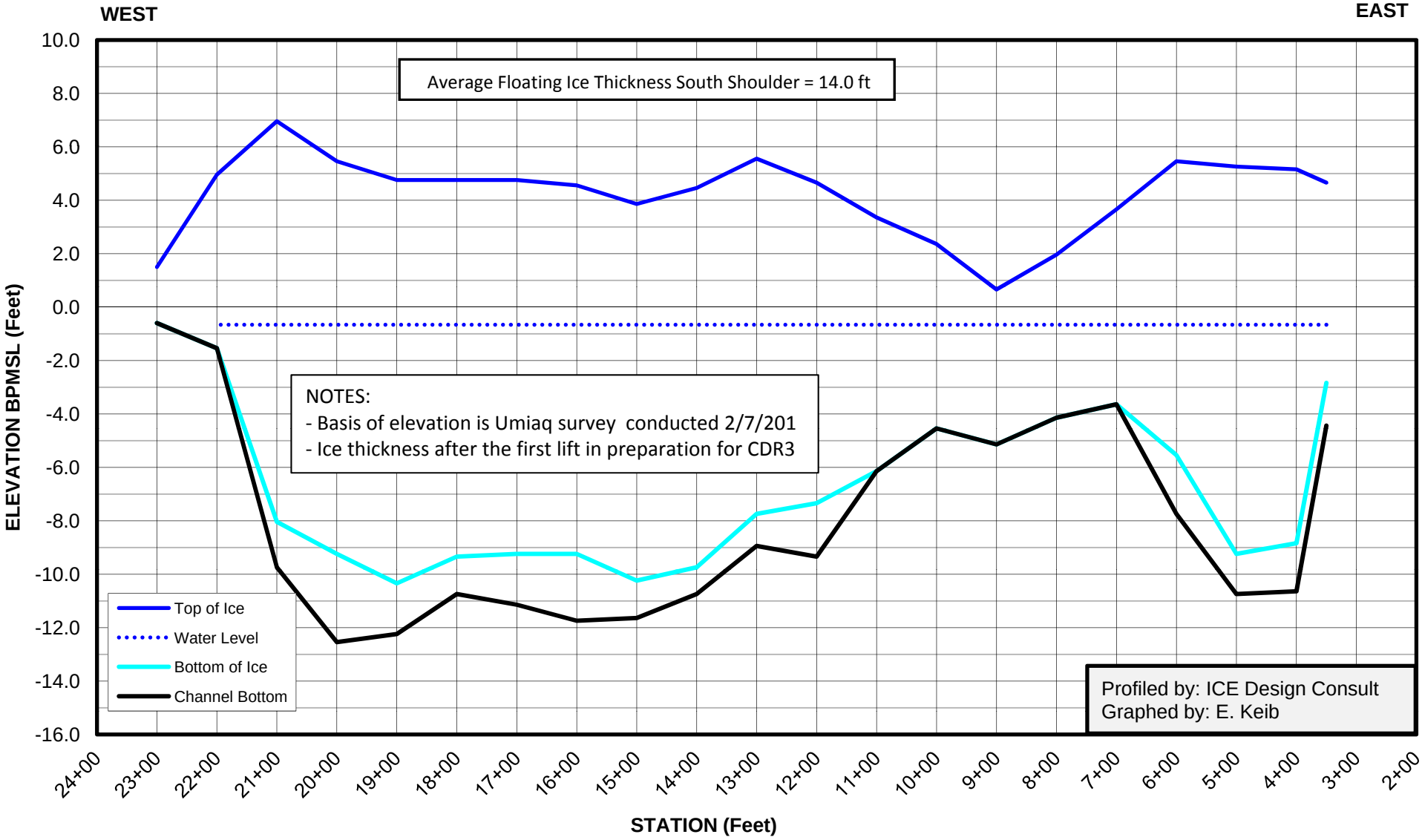
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
13-Apr-2018



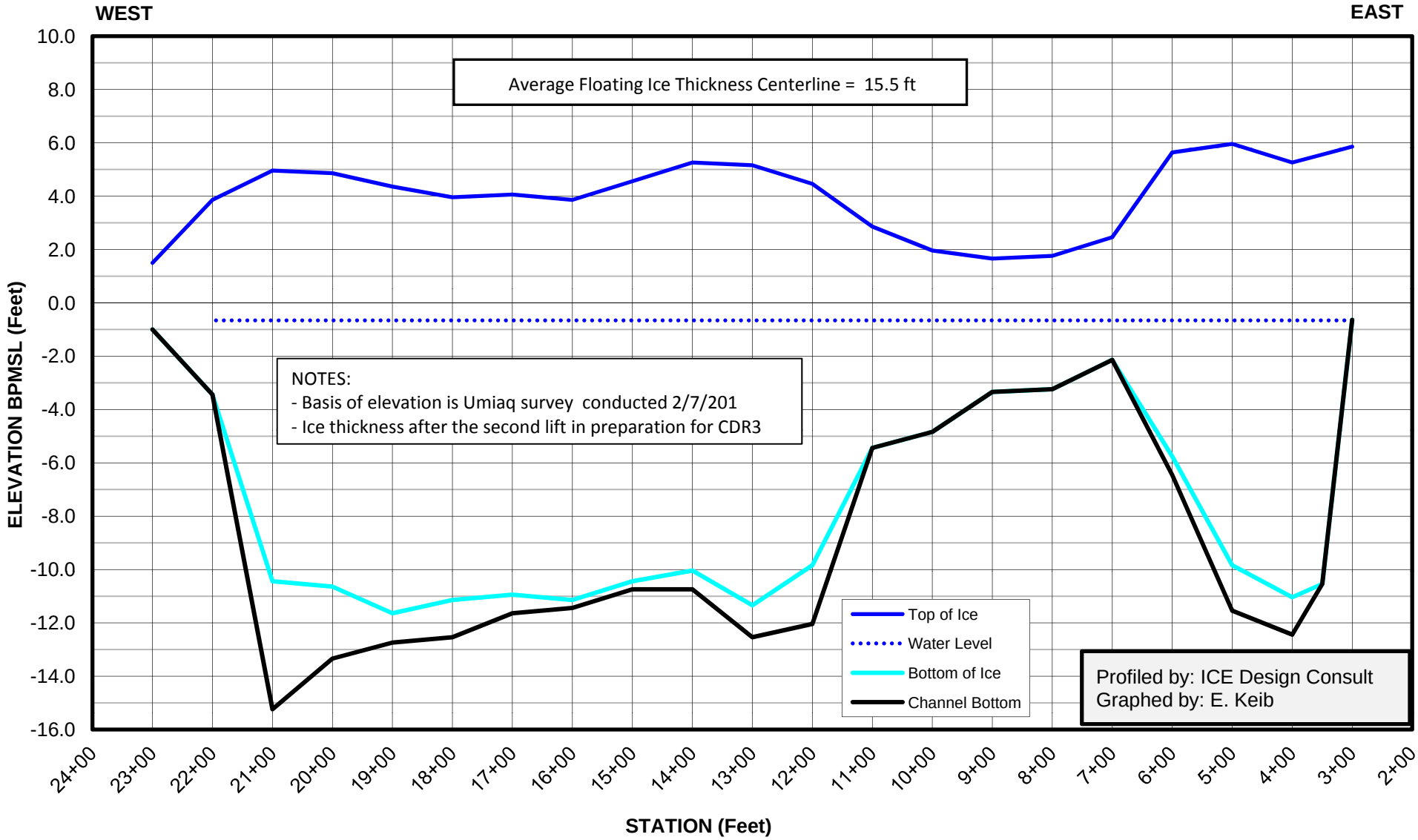
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
13-Apr-2018



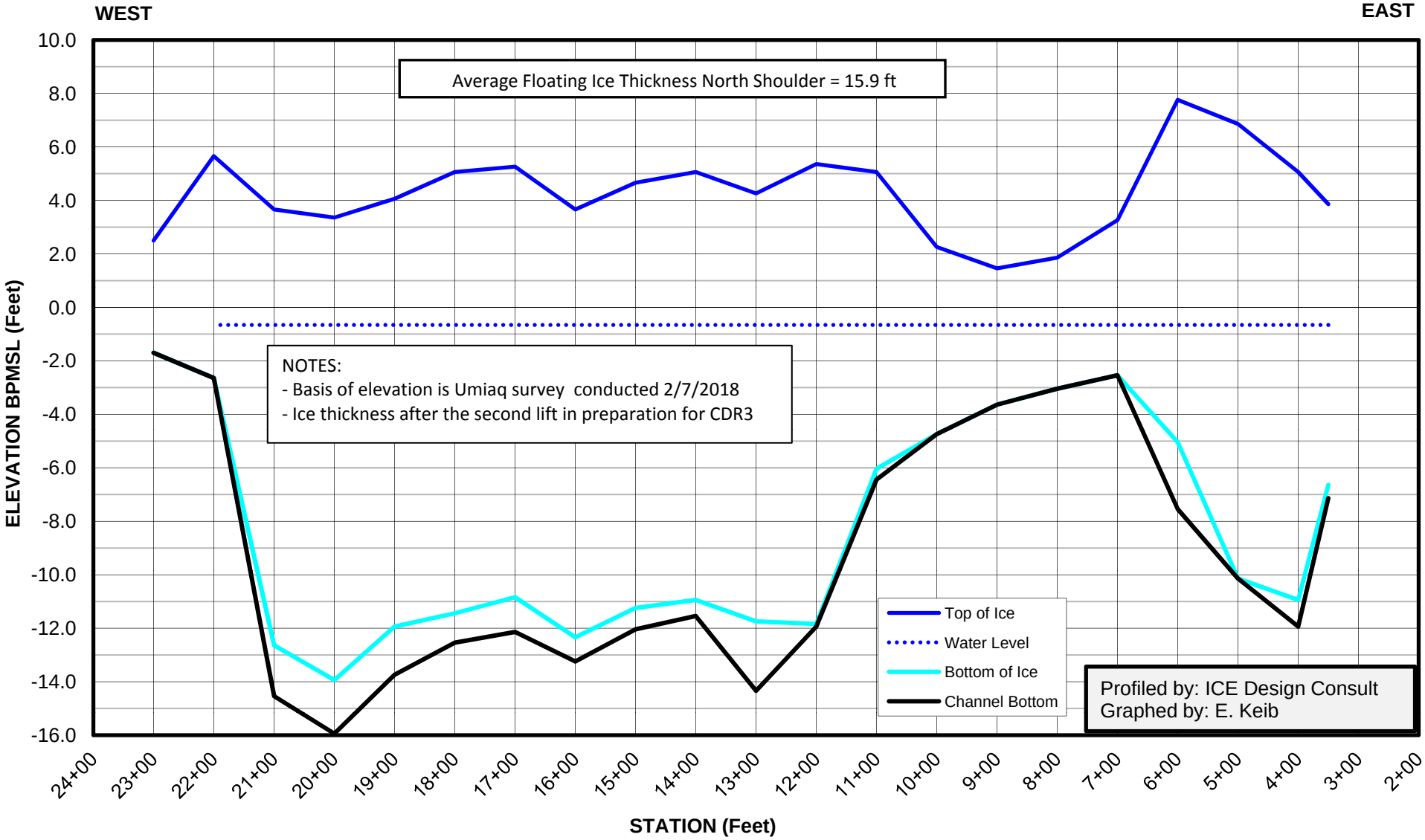
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
15-Apr-2018



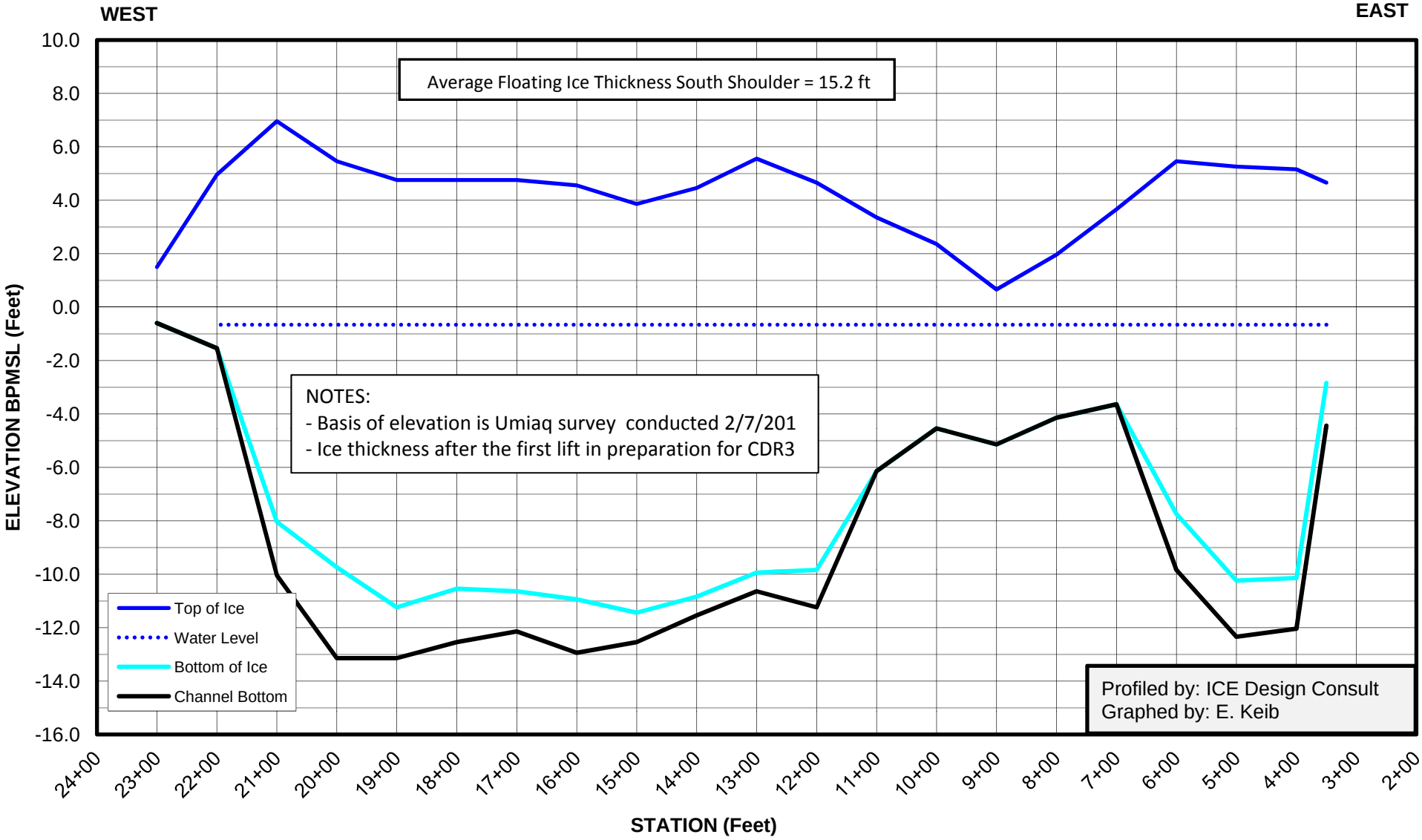
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
16-Apr-2018



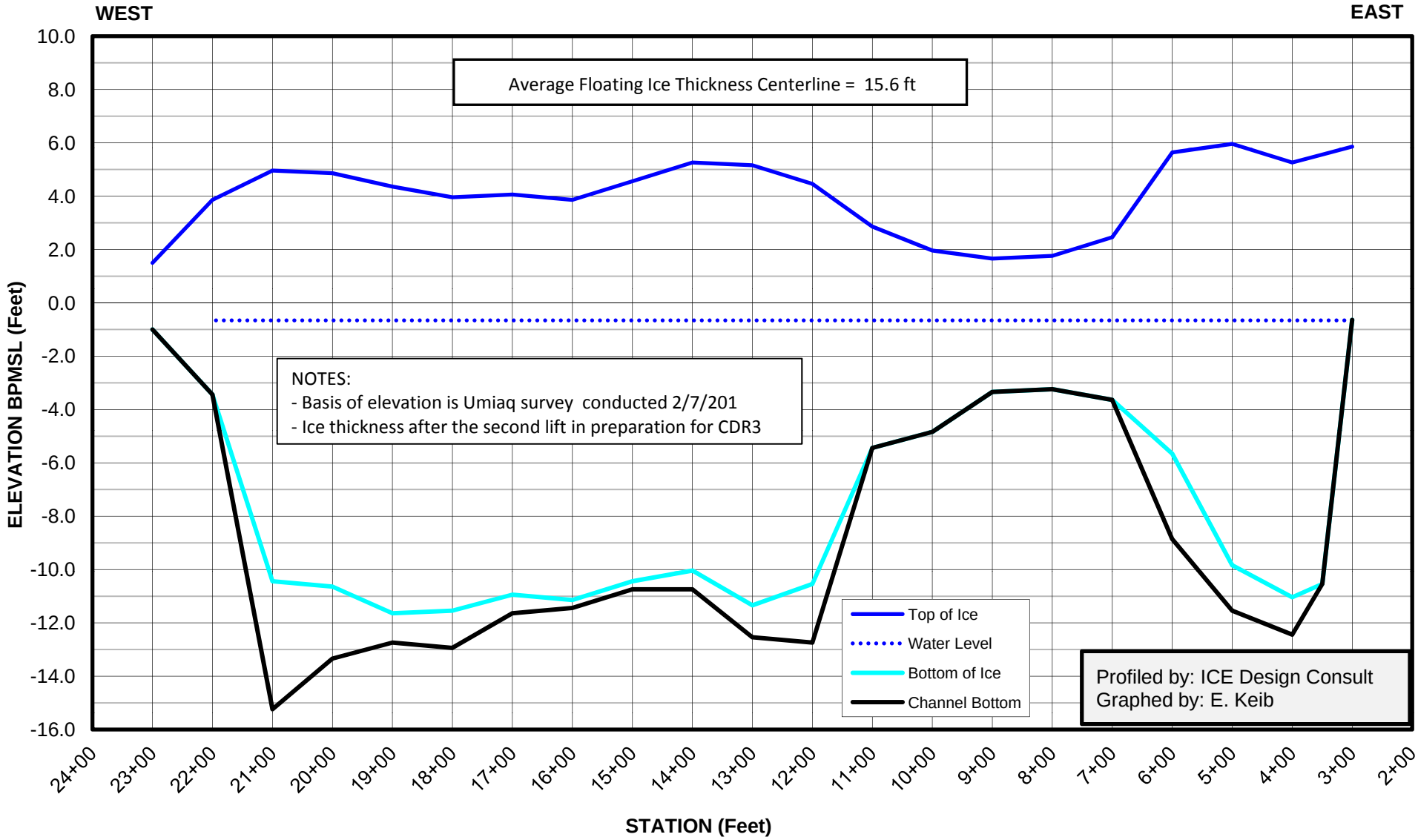
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
60' North of Centerline
16-Apr-2018



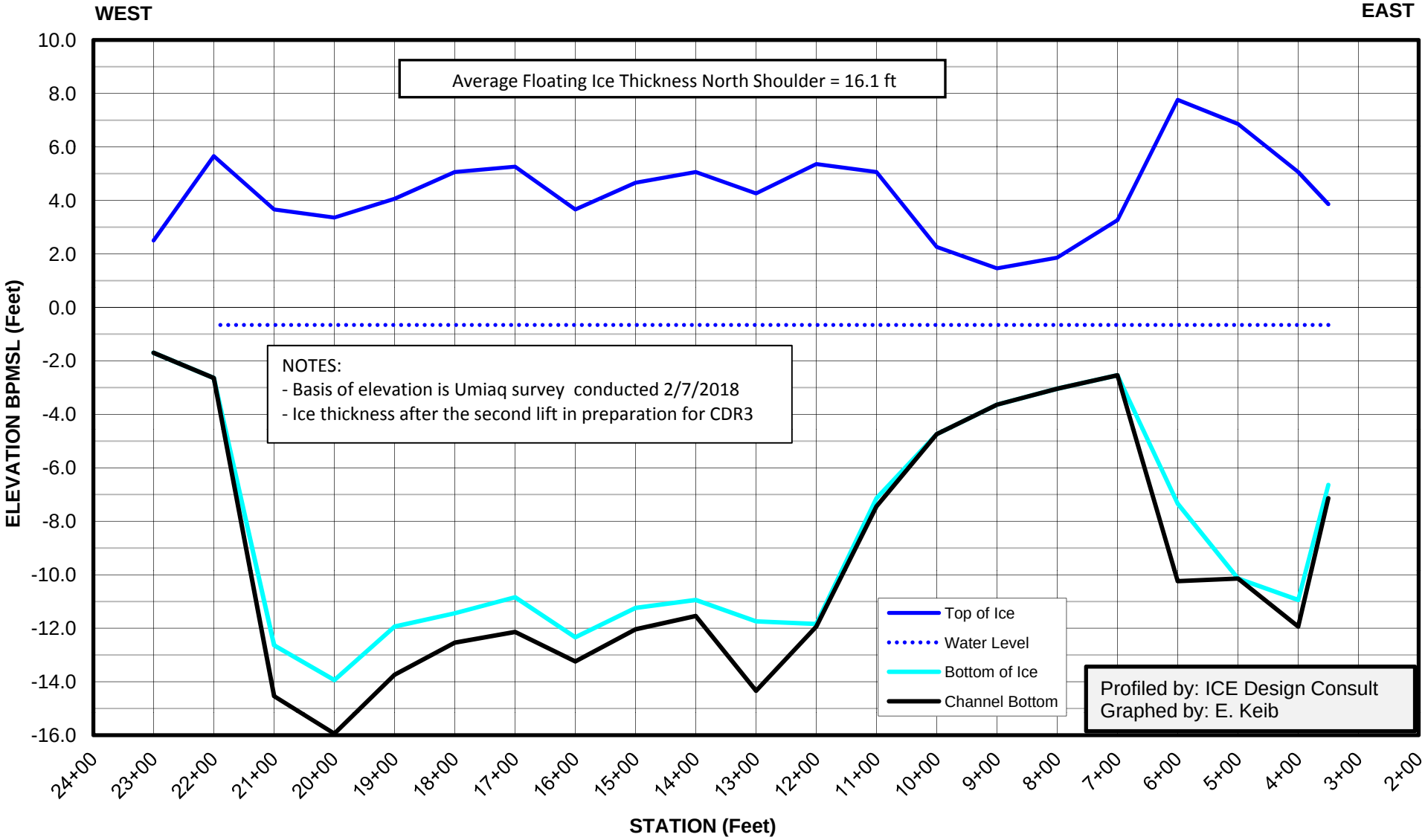
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
17-Apr-2018



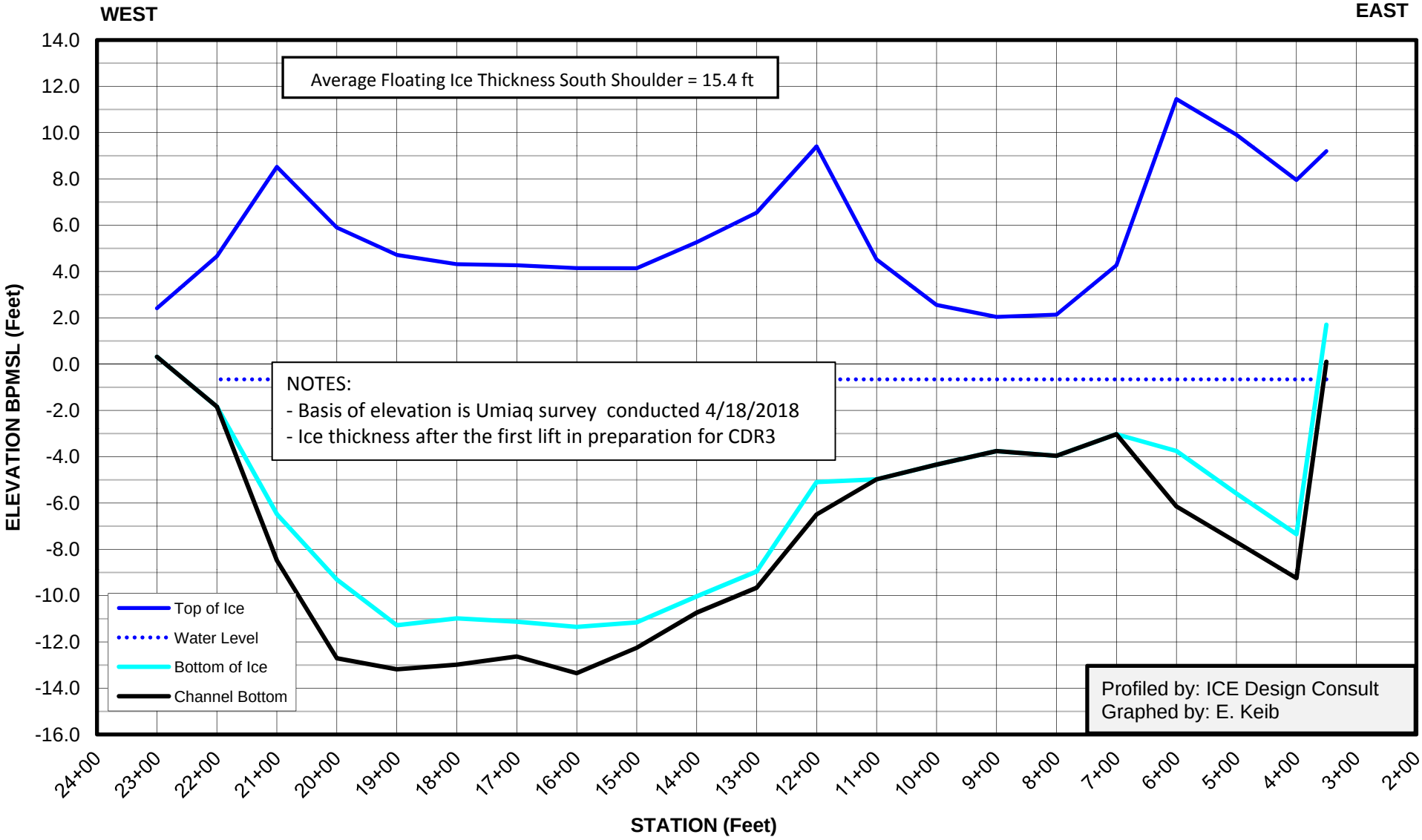
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
17-Apr-2018



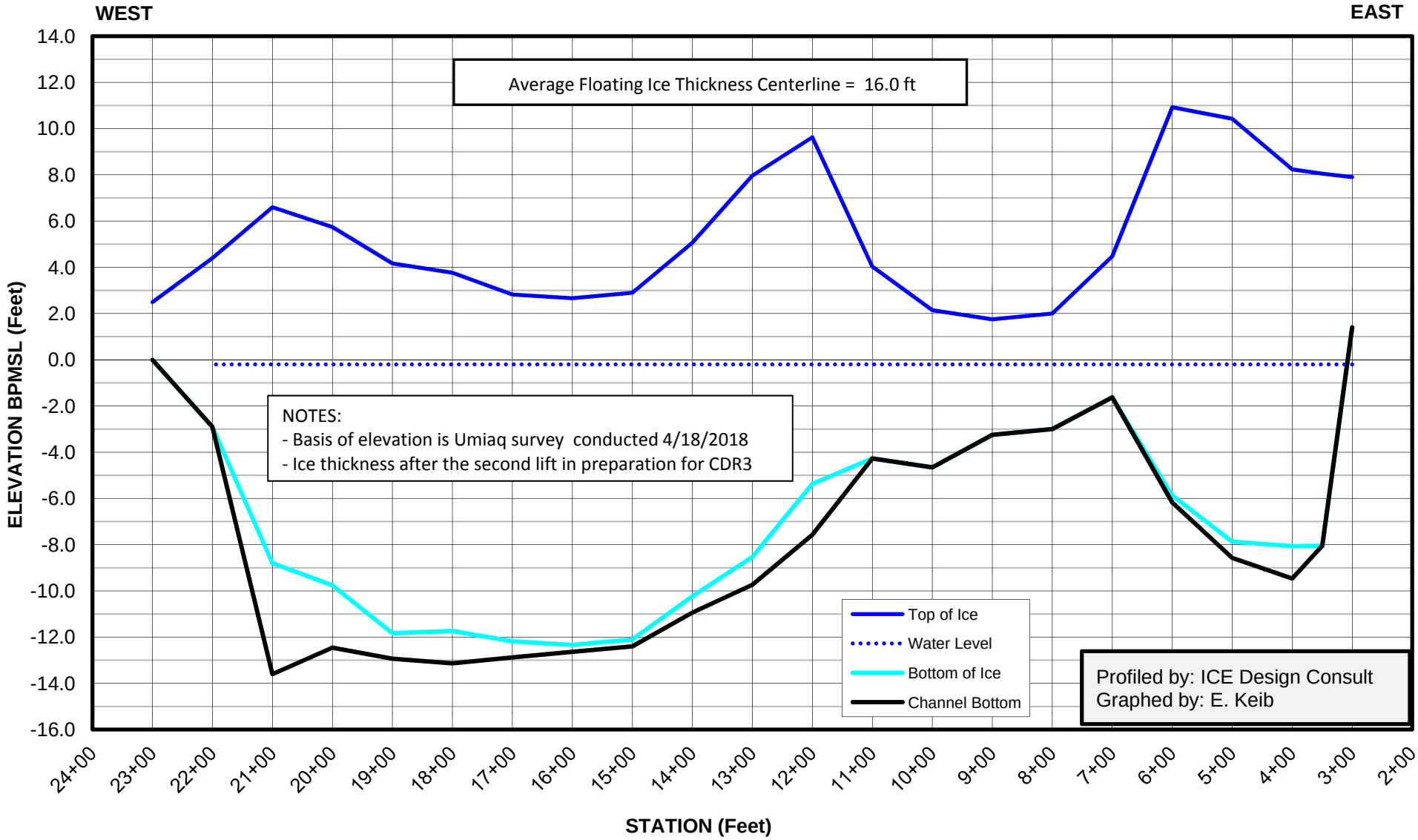
MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
17-Apr-2018



MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
SOUTH SHOULDER
90' South of Centerline
18-Apr-2018



MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
CENTERLINE
18-Apr-2018



MAIN CHANNEL COLVILLE RIVER
ICE ROAD CROSSING
NORTH SHOULDER
90' North of Centerline
18-Apr-2018